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BRIEFLY TOLD.

PRESIDENT BRITTON'S ADDRESS.—In this issue of the JOURNAL will be found the text of the address of Mr. John A. Britton, who, as President of the Pacific Coast Gas Association, naturally and officially was required to say something to the members in the way of welcome, and to recount what had been done, from his standpoint, in the matter of the supplying of light from central stations on the Pacific Coast during the year prior to and of the meeting time. Mr. Britton, of course, is a man of many parts, and in such diversity he has done well. He has, with proper backing and good talent on personal account, succeeded to the management of one of the tidiest lighting plants on the Pacific Coast—for he is President and Treasurer of the Oakland Gas Light and Heat Company, of Oakland, Cal.—and so it is to his credit that, while his Company is engaged in the supply of electric currents for one purpose or another, he has not forgotten that the commencing of its fortunes was in the supply of gas. But the genial gentleman seems to forget somehow, if we are to judge from his statement that "There is also a feeling of satisfaction in the fact that the gas and electric lighting interests of our particular district have to-day joined hands in a bond of fellowship more closely than was thought possible one year ago. Eminent gas engineers who a short twelvemonth ago denied the possibilities of electric lighting, have in the meantime become advanced from the realm of mere gas engineers to that of engineers of lighting, and have seen in the electric light a friend and a brother, adequate in its way to the advancing of the gas industry to a greater extent than it had before promised to injure it." The feeling of satisfaction in the laid out interest must be more apparent than real even in the Oakland instance, for Mr. Britton himself, if appealed to at the present time as to whether he would abandon preferably the gas or electric division of his Company's business, would undoubtedly reply, "Give me the gas; let the others take the electricity." And such decision would likely also be followed by his directors. Certainly we will have to admit that "mere gas engineers" are required, more and more every day, to know how to run electric lighting plants, for the simple reason that, in the many combinations of gas and electric lighting plants lately made, the gas man has had to take the "burden of thought" in their consolidated management to himself. For an instance of such combined duties we may name that which attaches to the management of the San Francisco Gas and Electric Company, the domain of which concern is not so far from Oakland as to put it out of court as a comparison sample. We make bold to say that if the San Francisco Gas Light Company had not taken over the electric lighting interests of California's chief city its shareholders would be better off than they are to-day; but, we suppose, "community of interest" must be given weight for a time. Meanwhile which is to be the profit gainer of the combination—the gas end, of course, if percentage of profit is to be fairly considered. Still, it goes that we do not have to travel to the Coast for a strict case or example of the sort under consideration. Recent happenings go to show like odd parallels to the San Francisco type in Cincinnati, O., and New York city, with two other stirring cases in St. Louis, Mo., and Baltimore, Md. Yes; we suppose it is right to put everything on the back of the camel that the poor beast can carry; but, for the sake of fairness, give

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some credit for long carrying capacity to the peculiar ridges on the back of the burdened beast. Undoubtedly gas and electricity have their fair fields for productiveness from a commercial standpoint, but those of the former outnumber those of the latter as 10 does 1. In fact if one goes a step or two further afield in President's Britton's address, one may be forgiven for believing that he is still a gas man in the reading that "Statistics of the growth of the business in this territory, carefully gleaned, determine that it has in the past decade far outreached in percentage of output that of any three decades preceding." The teaching of such gleaning is in the line of pointing out that the advantage is with gas. President Britton's address will repay a careful study of it.

NOTES.—Mr. Robert Bruce Steward informs us that his father, Mr. D. M. Steward, has purchased the entire plant and effects of the D. M. Steward Manufacturing Company, of Chattanooga, Tenn., and that the business will be continued by him under the same name that has characterized it for the past 25 years. The Company has established an Eastern and export office at 107 Chambers street, N. Y.——At the annual meeting of the Orange County Gas and Electric Light Company, of Middletown, N. Y., the Directors chosen were: F. P. S. Crane, J. W. Canfield, W. F. Crosby, Jno. H. Galloway, Ed. T. Hanford, H. M. Hayes, P. Jackson, C. L. Mead, L. H. Morgan, L. C. Purdy and T. L. Reeve.——At the annual meeting of the Consolidated Gas Company, of Baltimore, Md., the officers elected were: Directors, F. C. Latrobe, Chas. H. Dickey, W. W. Spence, W. F. Frick, John W. Hall, J. A. Gary, H. R. Wilson, Frank Tilford, Jno. E. Hurst, E. A. Jenkins, G. A. von Lingen and N. W. James; President, F. H. Latrobe; First Vice-President, Jas. A. Gary; Second Vice-President, C. H. Dickey; Treasurer, Jos. W. Clarke; Secretary, N. T. Meginnis. The reports showed a good increase in the Company's business for the twelvemonth.——The regular quarterly dividend of 2½ per cent. on the shares of the Municipal Gas Company, of Albany, N. Y., is payable the 1st prox.——At the annual meeting of the Gloucester (Mass.) Gas Light Company, the following officers were elected: Directors, George R. Bradford, Robt. R. Fears, George H. Perkins, John A. Coffin and Chas. S. Tappan; President, George R. Bradford, Clerk and Treasurer, David W. Low.——Mr. V. W. Duke, engineer in charge of the construction of the manufacturing and distributing plants of the Steelton (Pa.) Gas Company, writing in reply to our query in the JOURNAL for the 22d inst. as to why that construction was likely to be abandoned, says: "The gas plant at Steelton, Pa., has been under construction since 1st of June, and we have laid over 4 miles of mains. We expect to have the plant in operation by November 1st. The plant will have a daily capacity of 100,000 cubic feet, and will consist of a combined system of coal and water gas apparatus."

In Honor of Bunsen.

The *Gas World* says that at the eighth meeting of the German Electro-Chemical Society, held at Freiburg, Professor Ostwald, of Leipzig, one of Germany's most distinguished chemists, paid an eloquent tribute to the memory of Robert Bunsen and to the magnificent work of the great scientist to whom both science and industry owe so much. It was Bunsen, he said, who once made the remark that "a chemist who is no physicist is nothing," and it was Bunsen also who constantly kept in mind the practical side of scientific studies, and pointed out the duty of making industry profit by the discoveries of science. In continuing his address, Professor Ostwald said that the Electro-Chemical Society fully sympathized with Bunsen's views, but that its programme had been hitherto confined within somewhat narrow limits. He suggested that in future it should be expanded so as to make it embrace the whole realm of physical chemistry, and pursue as a distinct aim the establishment of closer relations between science and engineering. This change in the Society's aims should be indicated in future by its title, and choice of a title had given him considerable difficulty in the beginning.

At last the idea occurred to him to select the title, "German Bunsen Society," which would show in most lucid manner the true aims of the institution, and help to gather into its folds just those whom the Society should like to include among its members. Professor Ostwald's suggestion was received enthusiastically by all present, and would have been adopted unanimously by acclamation had the statutes permitted this method of changing the original title of the Society. There will, however, be a special meeting of the Society called in connection with the annual meeting of German Naturalists at Hamburg this summer, in order to make the required change, and from that date the German Electro-Chemical Society will be known as the German Bunsen Society, a name that will serve as an incitement to the members to pursue their work in the thorough and straightforward manner which characterized all that was done by Bunsen.

Address of the President (Mr. John A. Britton, of Oakland, Cal.) on the Occasion of the Ninth Annual Meeting of the Pacific Coast Gas Association, San Francisco, Cal., July 16 to 18, 1901.

I approach with some trepidation the submission of my address as President of the Pacific Coast Gas Association at its ninth annual session, realizing that such a position is not a mere perfunctory one, but rather one of direction and suggestion; and that the bright scintillations of the stars which have preceded me will dim my appearance in the firmament.

You will pardon me for retrospection, but the character of the growth of this industry warrants it.

When, on July 13th, 1893, the Association was called to order, 53 charter members had signed the roll. This number has in the eight years passed swelled to 121, while of those who gathered with us, the Great Reaper has called four to their eternal rest.

It has been eight years of great, good gatherings, of the intermingling of men who were then for the most part unknown to each other, and who have each and all benefited in a social and in a business way by such exchange of friendships as are called out in their fullest manner by gatherings such as these; and rare friendships have been formed that will last forever.

The papers that have been submitted in that time, and which form the three volumes which have been issued, bear the closest comparison with the papers issued by any of the gas associations in the United States; and the careful and undivided attention that has been given to the advice and instruction offered have all gone a long way in making this Association the equal if not the peer of all.

While we have not so far in our existence conferred the title of Honorary Member upon any person, we are so firmly established and so well recognized that we should at this time commence a list in which shall be placed the men who are pre-eminent in the profession, and who by the particular aid they have been to it are entitled to such preferment. Among these I would suggest the name of T. S. C. Lowe and that of M. Theo. Vautier, President Technical Society of Gas Industries in France.

The year that has just closed has been fraught with many matters of importance to the gas industries, not only of this nation, but of the entire world, the most prominent of which was the assembling of the International Congress of Gas Industries in Paris, where men of many tongues assembled to give in joint discussion voices for the betterment of the large interests represented, than which there are no larger in the many and varied pursuits of life.

The International Congress brought together such a body of men as it is hardly probable was ever before witnessed, representing not merely money, or its equivalent, but more particularly and essentially the gathering of intellect devoted to a pursuit which, next to the air which we breathe, is a positive essential to the welfare and happiness of the community. Of the character of the men there gathered, and their particular views our worthy Secretary will in due time enlighten you.

Perhaps the second thing in importance during the past year has been the large development of the gas engine for motive power, bringing by a single bound that worthy instrument of the distribution of our commodity from a mere plaything to a factor in the development of what formerly was our most dreaded opponent, but now our helpmeet. Of that development, in so far as the Pacific Coast district is concerned, our Mr. Casey will by practical example inform you.

The third thing in importance, in my estimation, has been the acceptance by the profession of the possibility of the distribution under high pressures of artificial gas, thereby rendering possible the diminution of invested capital and the supplying of outlying districts within the limits of cities and towns that otherwise would not have had, for some years perhaps (by reason of the large expenditures for street mains), received the advantages accruing under the use of gas, not only for lighting but also for fuel and power purposes. And it is a source of gratification to the pioneers in that particular branch that at least the gas world has acknowledged the possibility and commercial success of such a method of distribution.

These three epochs in our history represent far greater strides than have been made in any other year that has gone before. There is also a feeling of satisfaction in the fact that the gas and electric lighting interests of our particular district have to-day joined hands in a bond of fellowship more closely than was thought possible one year ago. Eminent gas engineers who a short twelve months ago derided the possibilities of electric lighting, have in the meantime become advanced from the realm of mere gas engineers to that of engineers of lighting, and have

seen in the electric light a friend and a brother adequate in its way to the advancing of the gas industry to a greater extent than it had before promised to injure it. In the domain of electricity lie possibilities for the exercise of the talents of gas engineers never before exercised. This demonstrates that the training necessary for the attainment of a position as a gas engineer fits a man to become the master of a broader field, without in the least decrying the cradle in which he was nurtured.

Statistics of the growth of the gas business in this territory, carefully gleaned, determine that it has in the past decade far outreached in percentage of output that of any three decades preceding. This can be attributed to one cause—the necessity for an active, energetic and positive commercial position by reason of competition, and an awakening to the necessity for getting in touch, as it were, with the light consuming people. Perhaps in no industry of modern times is there anything that can be compared with the attempts that have been made in the past two or three years by gas stove manufacturers and gas companies in general to introduce to the notice of their consumers the advantages of our commodity for fuel purposes, thereby assisting directly in the reduction of the prices which had been charged, by a larger consumption without material increase of plant. As to the methods by which this introduction of fuel may be made, there is an open ground for discussion; and it must largely be left to local conditions. At the same time it is to be deprecated that the conservative gas man has gone beyond the pace usually set for him to indulge in a species of advertising, at times, which is not only detrimental to the proper conduct of his business, but insures in the end dissatisfaction, not only among his consumers, but among the many purveyors of the articles which are sold for fuel purposes; and the direct result has been in most cases that an article has been placed upon the market and forced into the hands of gas consumers which is neither creditable nor productive of efficient and continuous sale.

As each Gas Association holds its annual session, we hear less and less of what was once the single string upon which the gas man played his tune—that of leakage. I am constrained to believe from many years of observation that the leakage proposition is a mere spectre which is coujured up by imperfect station meters, deficient manufacture, poor bookkeeping, faulty consumers' meters, which for a time elate the gas manager with wonderful productions of his apparatus, while they startle him with the large percentage of unaccounted-for gas. It is a twin brother of that other spectre of electrolysis, which has finally been captured and subdued.

I am looking forward to a time when the Gas Associations of the future will resolve themselves into advisory boards; when papers will be beaten into advice, and discussion into action. There is no territory within the confines of these United States that needs so much the active, regular and unintermittent supervision of a competent engineer, than the particular territory controlled by the Pacific Coast Gas Association. And while I do not in any way desire to detract from the material benefits that accrue to the managers and officers of suburban companies, by reason of our Association, I feel that, in justice to my position as your temporary adviser, I should suggest that there should be constituted in this Association an advisory board to whom the members of the Association could apply from time to time during the year for advice concerning the proper methods of operation of the different plants represented in this Association. Managers of smaller plants, whether gas or electric light or both, are general "Pooh Bahs" who are supposed to be competent in the line of civil and mechanical engineering, to be good chemists, to be affable in their treatment of the public, to have a supervision of the financial affairs of the institution, and to do all the things which in larger companies are generally controlled and disposed of by a corps of efficient employees. In the exercise of these duties, the general management of the manufacture of gas, and the generation of electricity, and their distribution, are necessarily lost sight of; and there is no company in existence to-day which would not be benefited many thousands of dollars by the advice of men who are competent to direct the proper care of such plants. The Association should be put upon such a plane that every manager and superintendent would feel that he had the right to call upon it for such advice as his conditions demanded; and to receive it freely and voluntarily, if necessary. I firmly believe that Associations of this character will not be a success in the line in which they are organized, unless members can command that talent. It would be of vastly more benefit than the reading of theses on any given subject, which are at best but the expression of the personal opinion of the writer.

The profession of gas engineering has not, in my judgment, received the attention it deserves in the scientific world. To my knowledge there is no college or institution to-day which has the power to confer upon any graduate the degree of gas engineer. As a consequence, the title is self-imposed, and often without any color of reason. Action should be taken, it seems to me, by this and other Associations, looking towards the granting by State Legislatures of the right to any duly organized college, university, or institute of technology, to confer upon a graduate, after a proper course in the necessary studies, that dignified title; and also to confer upon those who have had long years of service, and may by examination qualify themselves, the same title, so that the eminent position of gas engineer should be recognized among the scientific pursuits of life as fully and completely as that of any other engineering profession.

Municipal ownership is still extant, although in a somewhat modified form, the experience of cities experimenting in that form of management of public utilities not having been, so far as this Coast is concerned, an unqualified success. It is a condition which must be combatted entirely upon the political ground established in the community where it has its growth. But there is one safe and sure remedy that can be applied to cities where it does not exist as a preventative; and that is the placing of all quasi-public corporations upon a footing where criticism cannot be made of their methods of earning interest upon the moneys invested. Over-capitalization is one incentive to the establishment of municipal ownership. Quasi-public corporations have no more right to earn money upon false and fictitious valuations than has the government itself the right to establish taxation upon specious valuations of property. And where corporations, for the purpose of paying large dividends to their stockholders, place a value upon their investments far in advance of duplication of the same, they not only open themselves to attacks of that character, and to attacks of legitimate competition, but they also expose all other allied interests to the same fate. There is no question that a corporation has the right to earn a reasonable interest upon the money actually invested in its plants, whether in use to-day or not; but it has no moral or legal right to earn money upon properties which have been increased in value by adding interest upon interest, and by placing certain numbers of shares of stock upon the market at prices which represent by double and treble the legitimate value of the property which it is supposed to represent. And when boards of directors realize that such a course does not meet and will not meet with the approval of the public, then I confidently assert that the day will come when they will meet, and their charges will meet with the approval of the public, which is always ready to approve that which is right and condemn that which is wrong. Political control of local bodies, made either through the ballot box or other manner, by the corporation, is commonly productive of one result, and that is finally an attempt of the public to right itself either by municipal ownership, or by agitation for an opposition which will bring them for a time redress from their wrongs. While a policy such as I have outlined may save from municipal interference and legitimate opposition, it does not unfortunately protect from illegitimate attempts on the part of promoters to depreciate values of property by oppositions which have no foundation for their existence, other than that of extortion.

The recent discovery of large quantities of oil in the southern part of this territory has opened up a field for the development of the gas and electric industries which is peculiar to California. And should the production now in sight continue as a permanency, there is a strong possibility of an era of cheap lighting scarcely to be conceived of under any other circumstances. Already gas companies in this State are undertaking the making of their own distillates, and relying upon the sale of the residual product of the heavy crudes for a revenue far in excess of that derived from the ordinary residuals of coal gas, which are rapidly becoming things of the past. The commercial value of California oils will be enlarged upon by Mr. Lowe in his paper to be presented.

Water power transmission, astonishing the world by the magnitude of the ventures, has made a name and fame for our state which has done more to advertise it in the financial world than anything which has ever occurred before. Looking backward to the time when the direct current arc and incandescent, operating upon voltages of 100, were the only possibilities in electric lighting, to the present period when voltages reaching toward the 100,000 mark are not only possibilities but probabilities, we have an idea of the great stride which has been made in the distribution of that wonderful energy which can neither be seen nor heard, but which is to-day turning the wheels of progress that make possible the development of manufactures in our State which for years have lain dormant by reason of the lack of proper fuel. The harnessing of the mountain streams fed by the snow-capped hills, and leading them over hundreds of miles to seaport towns, is no mean enterprise; and the men who have been the factors in that new development are deserving of our highest esteem. One of these, Jno.

Martin will, during the session, tell you of the difficulties which had to be met, and which have been nobly overcome.

It is a singular fact, and one worthy of some discussion, that the prepayment meter has obtained no foothold upon the Pacific Coast. Its use on the Continent and in many of the Eastern States is more than general. Yet as in years gone by we tenaciously hold to the merits of a 3-diaphragm meter as against the 2-diaphragm, so perhaps in the lapse of time we may become converts to the benefits and advantages of the prepayment meter.

In connection with the Advisory Board that I have heretofore referred to, I would recommend the establishment at some convenient place in the business district, of an office of the Gas Association, which members from outlying towns when in the city could use for headquarters during the year, which office should be provided with an attendant, proper writing facilities and telephone; where all inquiries should be addressed by members and distributed by the Secretary of the Association to such of the Board as could answer them. The practical benefit from such an office would far outweigh the expense, which would at best be a trifling matter. This is a particular need in this district because of its long distances, and of the need that it has for a helping hand at all times. This would make the Association more than a mere social matter, and would raise it to a higher plane than ever before.

The recent action of the Legislature of this State, in passing an act for the submission to the people at the next general election of a constitutional amendment providing for a commission for the regulation of all quasi-public corporations, is a step in the right direction; and, while not passing judgment on the proposed amendment, it recalls the very good effect that is given to the profession which we represent by the Board of Gas and Electric Light Commissioners of the State of Massachusetts, the reports of which give in detail the statistics of the operation of all the companies in that commonwealth. This Commission, composed of men above reproach, has been a huge factor in the preservation of the interests of the capital there invested. And if a commission of equal character and probity could be established in this State, I venture the assertion that competition of the irresponsible kind would be annulled and municipal ownership would be silenced; for the records of that Commission for the past year prove that the interests of the consumer and the commonwealth have each been equally served, and that as low rates as are consistent with a proper return have been allowed, and all disagreements between companies and the people, whether the people are represented as individuals or as municipalities, have been adjusted justly.

There is another matter that should be taken up by the Association, and that is some well-directed, positive, continuous effort to procure for every member of this Association a simple and convenient manner for keeping all of their books of account. My personal observation prompts me to make this positive assertion, that with a better system than that now in use by most of the gas companies, a very considerable saving could be effected, for by the present methods managers are continually deceiving themselves as to productions, costs and expenses, and the business is managed more or less on the principle of believing it to be prosperous if the cash book shows a balance to the good after a month's operation. This benefit cannot be accomplished by papers written on the subject, but only by an application of a knowledge of accounting to each particular case; and this I look forward to being one of the benefits of an association.

The growth of the business of the gas companies of this district has been compiled from many answers I have received to the questions submitted to members; and I desire to heartily thank those who responded. Here I give the general averages of all.

Comparing 1890 *with* 1900.—The price of gas has been reduced 33⅓ per cent., notwithstanding that the price of material for its manufacture has not in the same time been materially reduced, and in some years intervening very materially increased. I ask, in all candor, what general commodity of public use can show such a benefit to its consumers, and this in the face of a continued, strongly increasing opposition during all of that time from electric lighting? The largest reduction noticed was 60 per cent., and the smallest 16 per cent.

The consumption of gas has in the same time increased 100 per cent., the largest being 400 per cent. in any one place. This increase seems to be due almost wholly to the increased sales of illuminating gas for fuel and power purposes, as no distinctive fuel gas plants are in operation on this Coast.

The average number of consumers per mile of main is 65, comparing unfavorably with Eastern cities, where it is very much in excess of that amount.

It is remarkable that the reports which I have mentioned show a capitalization per 1,000 feet of gas sold of only $10, but this will be understood when the small number of large companies operating in this district is considered, the smaller companies helping to keep down the amount. In most of the Eastern States the capitalization is only about $7 per 1,000 feet of gas sold.

There have been formed among the different classes and characters of labor trusts which have astonished the civilized world. But in the industries which we represent, and for whose betterment we are gathered together to-day, it is a remarkable fact that there never has been a time when with its wonderful aggregation of capital and intellectuality it has been found necessary, either in the president's office or in the cottage of the laborer, to form any trust or combination concerning the capital invested or the labor which makes that capital an earning possibility. With perhaps one or two exceptions it cannot be recalled that there ever has been within the limits of our profession a time when labor was dissatisfied with its employment, and still more rare, that it was found necessary to exercise the control of the capital represented in the protection of it against inroads of national or State or local legislation.

And now let us pause a moment in our wild rush in the world of greed and gold to stand with bowed heads and folded hands to pay a tribute to the soldiers in our ranks who have laid down the arms of battle to rest beneath the quiet stars. Here's to "Rosemary, that's for remembrance;" and here's to the Accacia that's for the glorious resurrection on the bright morning of that day when all shall take their stand before the Ruler of us all, and we may each of us meet upon the common level, undisturbed by the factions of life, to rest forever in that "House not made with hands, eternal in the heavens."

The Labor Question in Gas Works.

By Mr. George Livesey, in *Gas World*.

You ask me for a short contribution on the labor question in gas works, and you suggest that two recent events—the strike at Cork, Ireland, and the introduction of profit sharing at Chester—seem to make the opportunity. My difficulty is that I have nothing new to say on the subject, but "precept upon precept, line upon line" is as necessary for the gas industry as for learners generally.

The Importance of the Question.—The two great items of expenditure in gas works are for coal and labor. If from the former the receipts for products are deducted the second becomes an easy first. This fact fully justifies all the consideration that has been or can be given to the important question of labor in gas works, not in the direction of getting cheap labor, but of obtaining efficient, interested service, which, when given, ought to command good pay to the individual workers and be economical in the aggregate. For instance, the same rate of pay may be given for retort house labor by two adjoining companies, but the cost of carbonizing per ton of coal may be considerably less in one than in the other. This advantage is obtained when labor is efficient, and, theoretically, it should be one of the results of the adoption of profit sharing. We thus have the apparent anomaly that with higher emolument to the individual worker the actual cost per ton is lower.

Lessons of the Cork Strike.—The Cork strike shows that the spirit which came so prominently forward with the advent of the Gas Workers' Union in 1889 is as rampant as ever. The thanks of all gas undertakings are due to the directors and officers, and especially to Mr. Magrath, for the courage and determination with which they have resisted the attempt on the part of their men, instigated by the spirit of trade unionism, to control the business of the Gas Company. I am especially glad to see the stand they have made in support of the new men who came to their help in their difficulty. One of the most dastardly actions of which employers can be guilty, and of which they not infrequently are guilty, after a strike, is to throw over the men who came to their help. Strikers often make this a condition of returning to work, as they did at Leeds in 1890; and ever since the men have been masters there.

Such events as the Cork strike, and the paragraphs that frequently appear in the technical journals, announcing that here and there this and that demand has been made by the men through their union, and the references so often made by engineers and managers to labor difficulties, or to the fear of them, prove that the present system of wage payment does not insure efficiency or promote peace and goodwill, or produce identity of interest between employers and employed. Yet little or nothing is done to remedy the evil.

Encouragement from Chester.—The recent action of the Chester Gas Company, led by their Chairman, in introducing a profit sharing sys-

tem, is very encouraging. Doubly so, in fact, first, because the initiative was taken by the Company without any outside prompting or pressure, and, secondly, because the employees have responded so readily in the right spirit. If properly and intelligently worked, as I believe it will be, no prophetic power is required to predict a happy future for that Company so far as the labor question is concerned.

I confess I was beginning to despair of any extension of the system in gas works. The Chester case is, therefore, a welcome encouragement. It is not so much the non-adoption of our system but the general apathy that is the serious matter. If not convinced that it is wise to adopt a system of profit sharing as a stepping stone to shareholding, why is not some other effort made to put the labor question on a satisfactory basis?

Twelve Years' Experience of Profit Sharing.—I will not occupy your space by a repetition of the details of our system. Suffice it to say that, after 12 years working by the South Metropolitan and 7 years by the Crystal Palace District Gas Companies, all are agreed that it has removed one of the greatest causes of anxiety and care from which gas managers suffer, and while benefiting the companies it has also greatly benefited a large proportion of the employees, who are now considerable shareholders—an abundant reward for the care and attention devoted to, and necessary for, the successful working of the profit sharing system.

In reply to your inquiry as to the practicability of profit sharing and trade unionism working side by side, I can only say that in many instances in connection with other industries they do so work. At the Crystal Palace District gas works, when the system was introduced, the men were told that membership of their union would in no way be interfered with, and from 1894 to the present time no trouble whatever has arisen on that account.

"*The Desideratum.*"—The desideratum is to create unity or identity of interest between capital and labor, employer and employed. This the wages system fails to do, and simple profit sharing, distributing the annual bonus in cash, although a good step in the right direction, is only a step, and unless another and more important step be taken will most likely fail. That other step is partnership or shareholding, and the only way that I can see for making the great body of employees shareholders is by means of profit sharing—paying certainly not less than half the annual bonus in stock or shares. For this gas companies have great facilities; and amongst the important services they have rendered to the community not the least may be to show how industrial peace and goodwill may be attained, and the employed induced to work heartily with their employers for the prosperity of the business by which they both live and in which they have a common interest.

If any better system can be devised for the attainment of these desirable objects, by all means let it be made public and adopted: but failing that, profit sharing plus shareholding keeps the field.

By-Product Coke Ovens in the United States.

By Dr. F. Schniewind, in *Iron Age.*

Another of the large steel works in this country—namely, the Maryland Steel Company, at Sparrow's Point, Md.—has decided to equip its plant with modern coke ovens instead of producing coke by the antiquated and wasteful beehive process. The list of coke ovens erected by the United Coke and Gas Company in this country and Canada, as given below, must be convincing proof that the American blast furnace men have abandoned their prejudice against by-product coke. By exhaustive investigations and careful observations in the actual blast furnace practice the following facts have been demonstrated:

1. If manufactured from the same coal, by-product coke is at least equal and in many instances better than beehive coke. It is denser and harder, and, consequently, better adapted to the modern furnace of larger size.

2. The retort coke oven produces a high grade blast furnace coke from coals which could not be successfully coked in beehive ovens. This opens up new coal fields for coking purposes and makes the blast furnace independent of Connellsville coke.

3. The value of the by-products incidentally recovered greatly reduces the cost of the coke. This is especially true when the coke plant is situated near a large city, where the surplus gas can be sold for illuminating purpose.

The plant to be erected for the Maryland Steel Company by the United Coke and Gas Company will be located at Sparrow's Point, Md. The erection will commence immediately, and it is expected to complete the works early next year.

The ovens will be of an improved type, which has been protected by United States patent No. 673,928. As this coke oven will be of general interest, we will give a short description of the same. A battery consists of 50 coke ovens. The retorts 1 are filled with coal through a number of charging holes, 2. The number and spacing of these charging holes is designed to give as uniform a distribution of the coal charge in the retort as possible, in order to reduce the labor of leveling the coal charge to a minimum. This leveling is done from both sides of the retort through the openings 3, Fig. 2, in the coke oven doors 4. When the oven is around—*i. e.*, when all the volatile matter has been driven off—a movable pushing machine is brought opposite the retort and the entire coke charge forced out on to either a stationary or movable platform. This apparatus, as well as the charging apparatus, have been described in previous articles, and do not need to be discussed here.

One of the principal differences between this coke oven and the other types is the placing of the entire oven structure upon steel columns, which makes the oven accessible from every point below. This steel substructure consists of a number of vertical columns, 5, upon which rests heavy plate girders, 6. These again support a number of small I-beams, 7, which carry the oven proper. The fact that the oven is accessible from below permits the supply of gas required for the heating of the ovens by a number of accessible burners arranged underneath. The gas supply can be regulated in such manner that each part of the oven obtains the required amount of heat in order to maintain a uniform temperature throughout the entire retort. This is a great advantage over the Otto-Hoffmann ovens. Another advantage is the certainty that no movement in the foundations or lower part of the brick work will affect the oven walls. The tightness of the oven walls is, of course, the keynote to the success of the by-product coke ovens, as the yield and the quality of the by-products depend upon the same.

The heating of the oven is done in the following manner, based upon the Siemens regenerative principles: For a part of the time, say, for instance, ½ hour, the gas is supplied to the ovens through pipe 8, Fig. 2. The amount required for each part of the oven enters through the vertical tuyeres 10, each of which can be regulated by a separate cock 11. The gas then enters the combustion chambers underneath the side walls of the ovens 12, where it is burned by highly superheated air coming from the regenerators, to be described later on, and entering into the combustion chamber through small portholes 13, Fig. 2. There are in

List of By-Product Coke Ovens Erected or Building by the United Coke and Gas Company.

Name of Owner.	Location of Plant.	No. of Ovens.	Character of Coke Produced.	Use of Gas.	Kind of Coal Used.
Cambria Steel Company	Johnstown, Pa.				
First installment		60	Blast furnace.	Fuel.	Washed.
Second installment		100	Blast furnace.	Fuel.	Conemaugh.
Pittsburg Gas and Coke Company	Glassport, Pa.	120	Blast furn. and domestic.	Fuel.	Youghiogheny run of mine.
New England Gas and Coke Company	Everett, Mass.	400	Domestic and locomotive.	Illuminating.	Cape Breton washed slack.
Dominion Iron and Steel Company	Sydney, C. B.	400	Blast furnace.	Fuel.	Cape Breton washed slack.
Hamilton Otto Coke Company	Hamilton, O.	50	Foundry and domestic.	Illuminating.	Kanawha run of mine.
Lackawanna Iron and Steel Company	Lebanon, Pa.	232	Blast furnace.	Fuel.	Washed Vintondale slack.
Lackawanna Iron and Steel Company	Buffalo, N. Y.	564	Blast furnace.	Fuel.	Washed Vintondale slack.
South Jersey Gas, Electric and Traction Company	Camden, N. J.	100	Foundry and domestic.	Illuminating.	Undecided.
Maryland Steel Company	Sparrow's P'nt, Md.	200	Blast furnace.	Illuminating and fuel.	Undecided.
Total number of ovens		2,226			

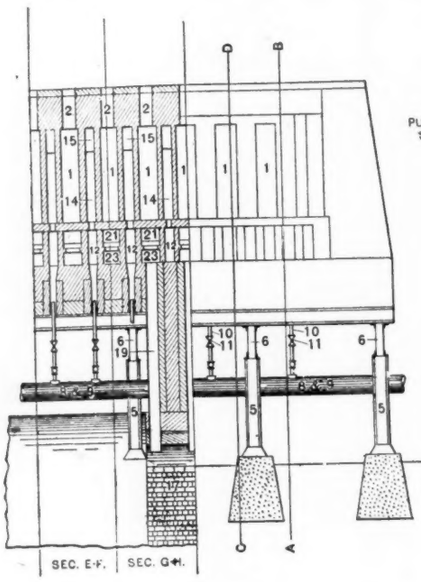

Fig. 1.—Cross Sections.

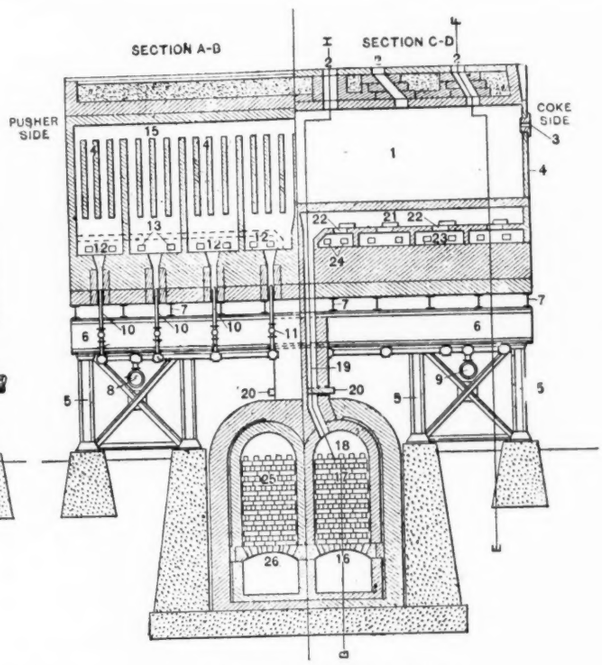

Fig. 2.—Longitudinal Sections.

The New Regenerative By-Product Coke Oven—United Coke and Gas Company.

all 8 combustion chambers, of which only 4 are shown in section *A B* of Fig. 2. The flames then ascend through vertical flues 14, Fig. 1, to the upper horizontal flue 15, in which they travel over to the other half of the retort and descend again through a corresponding number of vertical flues arranged between the retorts, and ultimately fall into the regenerator.

In order to follow the air supply through the retort we will now assume that the oven has been reversed—that is, that the gas for the combustion is brought to the oven through the main fuel gas pipe 9, to the right in Fig. 2, and the flames travel in the opposite direction. The tuyeres, which admitted the gas to the several parts of the ovens, are not shown in section *C D*, Fig. 2, but are, of course, the same as described above for section *A B*. The air supply is as follows: Cold air is blown by means of a fan into the bottom of the regenerator through flue 16, Fig. 2. The air then rises through checker work 17, and arrives in the upper regenerative chamber 18 with a temperature of about 1,850° F. This regenerator runs underneath the ovens along the entire battery.

Each oven receives the necessary amount of air through the vertical flues 19, Fig. 2. The air supply can be regulated by means of an accessible brick damper 20, Fig. 2. The hot air then passes underneath the bottom of the retort through flue 21. Here it divides according to the number of separate combustion chambers arranged under the side walls and passes through the portholes 22 into the lower air chambers 23. The amount of air passing through each porthole 22 can be regulated by means of slide dampers to be adjusted once for ever for each oven. From the lower air chamber the air then passes to the combustion chamber through openings 24, corresponding with openings 13 in section *A B*. The hot gases, after having passed from the coke side of the oven to the pusher side through horizontal flue 15, then will descend through vertical flues 14 and pass through opening 13 into the air chamber underneath the retort, corresponding to 23 on the coke side, and will then fall through another vertical flue corresponding with 19 into the regenerator 25, which is being heated up. The cold gases, deprived of their surplus heat, will finally go through flue 26 to the stack.

When checker work 25 has become hot and checker work 17, comparatively speaking, cold, then the reversing valves for gas and air for the entire battery are changed and the current of air and gas goes again in the opposite direction. The reversing takes place at half hourly intervals.

This arrangement assures a uniform heat distribution, which is very difficult to obtain in by-product coke ovens. Furthermore, the entire oven structure proper is independent of the regenerators and foundations, so that it is open to inspection without disturbing the operations. The accessibilty of the fuel gas piping is also a desirable feature. The cost of the steel foundations is less than those of the old brick foundations of by-product coke ovens.

The ovens to be erected for the Maryland Steel Company will be of very large capacity; in fact, larger than ever built before. Their daily carbonizing capacity will be 8 net tons of coal, producing on average American coals 75 per cent., or 6 tons of coke. The plant will be equipped throughout with labor saving machinery and modern gas and by-product apparatus.

A Peculiar Example Concerning the Deterioration of Wrought Iron Pipe.

Mr. William Wark, in a communication to the "Proceedings" of the Institution of Civil Engineers, reports an unusual experience with wrought iron pipe buried in light sandy soil at Hay, N. S. W. In the year 1885 the gas works were built, and the usual course was adopted of laying the consumers' services of ordinary black wrought iron pipe. The conditions of climate appeared to warrant the expectation that precautions such as are usual in the humid climate of the United Kingdom would not require the same consideration in New South Wales. It was assumed that the dryness of the climate would constitute a factor in the preservation of all ironwork, and this has proved to be so, but only in the case of iron not in contact with the soil.

After the lapse of 11 years, attention was drawn to a steady increase in the amount of gas unaccounted for, and examination led to the discovery that the pipes had completely perished, and exposure to the air had caused them in some instances to crumble to pieces, while in others the granulated appearance of the external surface suggested galvanic action between the metallic base of the soil and the wrought iron. The suggestion that the action of coal gas was in any measure accountable for the corrosion, was not upheld by any facts elicited during the investigation. The interior of the pipes may, through the action of impurities in the gas, scale and become filled with rust; but the evidence in case strongly supported the assumption that the injury was due principally to external causes, and this theory is partially borne out by the fact that wrought iron water service pipes, in the town, have a life of only 7 years.

The influence of soil in contact with the metal has been held responsible for the structural alteration of its character, but it has not been proved that the deterioration is due to the constituents of the soil, to dampness, or to the alternations of moisture and dryness; and it is probable that, owing to the light character of the soil, the great variations of temperature throughout the seasons exercised some influence. Analysis of the soil disclosed the presence of large quantities of com-

mon salt and magnesium chloride, in addition to iron, alumina, silica, lime and phosphates. Owing to the dryness, heat and length of the summer season, it is customary to water the streets frequently, and, as they are uniformly level and without any system of drainage, the subsoil is continuously damp. It is conjectured that, as the result of this periodical and frequent street watering, the combination of carbonic acid with the moisture so readily absorbed by the porous earth, formed the basis of chemical action, and the alternate moisture and dryness no doubt greatly facilitated the process of deterioration. To all appearance, the trouble is confined to wrought iron, the cast iron mains not showing any signs of unusual injury. Experience in other parts of the Colony is quite at variance with that at Hay. In Bathurst, where the soil is of a rotten granite nature, services are still in use, and apparently quite sound, after a life of 27 years.

In relaying the Hay services the preservative measures adopted consisted in applying heat to the pipe and then coating it with boiling coal tar, with a little lime added to neutralize the carbonic acid before application, and in imbedding the pipe in a layer of asphalt. Raw tar is not well suited for coating iron. Instances have been known of damage resulting from its use, the injurious action arising from the presence of carbonic acid. Exception has been taken to the inference that lime exerts a protective influence over wrought iron, since from its hygroscopic character it must act as the vehicle for conveying the very element which it should be the aim to exclude. Where clay is obtainable, puddle is recommended for the envelopment of pipes, as a preventive against injury by corrosion.

Portland Cement Testing.[1]

The more one comes in contact with those who have to do with the using of cement, the more one is struck with the want of knowledge of the characteristics of it, and the points to be observed in so using it, that its good qualities are not killed or impaired in the using. It is not at all an uncommon thing to see a large heap of cement gauged, and, after using a portion of it, the remainder allowed to rest for periods amounting sometimes up to perhaps 24 hours; then being worked up again with more water and used in the work in a sort of blissful or innocent expectation that, although the cement has been killed, and therefore rendered nearly useless, it will somehow harden and do the work it has to do. This is, of course, as a rule done in ignorance. Such killed cement may, and probably does, harden to a certain extent in course of time, but if it has to carry what it has to carry in a very short time, a grave risk is run of its failing and probably entailing a large amount of damage and cost. Again, in talking to engineers, surveyors, etc., if the question is asked as to whether they test the cement they use, the answer is frequently given that it is not necessary, as they only buy an approved cement. This answer is, of course, given through ignorance of the amount of care and trouble that must be taken to insure good quality, and that the fatlure or neglect on the part of any one of a considerable number of men may result in a cement of bad quality.

The quality of Portland cement depends on three or four conditions in the process of manufacture, as follows:

First, the raw materials must be mixed in such a proportion that when the cement is finished it shall contain about 61 or 62 per cent. of lime, and although the arrangement as to proportions of the different raw materials may be in the hands of reliable and responsible men, the actual weighing, measurement, or mixing of them is nearly, if not quite, always in the hands of the ordinary day laborer. Should there be any fault in this mixing, what may be the result? Supposing that the mixing is irregular, the proportion of lime may vary 5 or 6 per cent., or even more, with the result that some of the cement may be over-limed to a dangerous extent, while some of the other may be under-limed to the same extent. The question then rises as to how this affects the work, and points to the necessity of the user testing all the cement he has to use. Instead of the irregularity mentioned, it may be that the cement is by accident or neglect regularly over-limed for a considerable time, and this over-limed cement reach the hands of the user. If it is not tested by him before using, but is put into its work either in concreting or plastering or the jointing of brickwork, the tendency that it has to swell and crack, through its being over-limed, must necessarily in all cases lead to trouble, cost, and probable danger, which could all have been prevented had the user tested the cement, as every user, whether of large or small quantities, should do. Through this want of testing one hears of such things as concrete swelling or rising up after a large amount of brickwork has been put on it, necessitating not only the concreting being done again, but the pulling down and rebuilding of all their brickwork. One hears of walls of buildings being pushed over by concrete floors swelling, which also could have been prevented had the cement been tested by the user. Probably this testing is often neglected through the user having the idea that in order to test the cement it is necessary to have an elaborate plant and fine laboratory, and that it needs an expensive tester to carry out such tests. This, however, is not so. With proper plant, which at the most need only cost say under $100, an office boy or laborer with ordinary common sense can do all that is necessary, and the cost of the plant would naturally be saved if only one job was prevented from being spoilt by its use. If this cost is more than the user wishes to go to, it can be very considerably cut down by leaving out some of the testing plant and putting up with such testing apparatus not being so complete. This, of course, would not be so well, but could at any rate be complete enough to prevent such damages as mentioned above. There are also one or two simple tests that can be made practically without apparatus to prove the soundness of cement, viz., its not being over-limed. Cement mixed with water to about the consistency of treacle is poured into a bottle, such as a medicine bottle, and shaken until it overflows. This bottle is then placed on one side. If the cement is over-limed, or even if the proper grinding and amalgamation of the raw materials have not been made, the cement in the bottle will, after a length of time, varying according to how much that cement is over-limed or how badly ground and mixed, split the bottle. If, on the other hand, the cement is under-limed, the cement in the bottle will contract and become loose in it. This shrinkage is, of course, not so bad a fault as the expansion of it from over-liming, but for all that it is most undesirable, seeing that it is a sign of a weak cement and, as a rule, is of a bad color. There is also another easy test for this, viz., as follows:

Cement is mixed with water as before, but instead of placing it in a bottle it is put upon a shovel or piece of thin sheet iron, which in its turn is placed upon a fire, top of a boiler, or anywhere where the water can be quickly evaporated from it, care being taken not to have it hot enough to boil the water out. If the cement is a sound one it will remain solid and harden to a certain extent, but if over-limed or badly mixed, it will crack more or less, according to how bad it is. Another simple test is to gauge up a little cement to a very stiff paste, and put it, in the form of a pat, with its surface smoothed, upon some non-absorbent material such as glass or slate. This should be allowed to set or harden in the air, after which a very good idea may be obtained as to its soundness by dipping the finger in water and passing it quickly over the pat in such a way as to leave some water on it, or a little water may be dropped upon it. If the cement is over-limed the water will be sucked in instantly; if it is about right it will be sucked in more gradually, taking, say, from 3 to 6 seconds to be absorbed, and if undermined will take a correspondingly longer time to be absorbed. This pat may then, in order to obtain a more definite proof as to its soundness, be placed in water, where, if over-limed, and in a time varying according to how much over-limed, the pat will crack, and if bad enough, fall to pieces. These are simple ways of testing the cement that, as we said before, may be carried out by anyone, and yet will, if used, prove the most important point as to whether the cement may be used in work. If the complete plant is obtained for testing cement in the ordinary way, the test for soundness is made at the same time as the test for tensile strain.

The testing of the tensile strain is looked upon generally as the most important test of all. In order to make this test, cement is gauged with water to a stiff paste and placed in a mould, where it is allowed to set. It is then taken out, and 24 hours after being gauged is put into water, where it remains for 6 days more. If it has not expanded, cracked, or fretted, it is then placed in machines for the purpose, and pulled apart, this giving the strength it is capable of showing. The usual test for cement is that it must show a tensile strain of not less than 350 pounds or 400 pounds per square inch, the 1-inch square being now the usual section tested. There is another system sometimes used for making these moulds, which is known as the Arnold system. In this test the proper quantity of cement necessary for making the briquette is weighed, and is put into a mould of twice the depth of the briquette required. A die of one-half the depth of the mould is then placed upon the top of the cement in it, and is forced down by a powerful screw until it presses it to the 1-inch depth needed in the finished briquette. The mould altogether is then placed under water, and the cement takes up whatever water is necessary. The briquette is then taken out and treated in exactly the same way as the hand-gauged briquette. This test, although brought out much later than the hand gauging, has not become very

1. *The Builder*, London, Eng.

popular, although, looking at it generally, it obviates a number of faults that are found with the hand-gauging. For instance, different operators with hand-gauging make a very large amount of difference in the test a briquette will stand, as the hand-gauging is more or less thoroughly done. It also shows in one-third of the time any sign of cracking, and therefore the proof as to the cement being sound or unsound is much sooner arrived at. In addition to this test for soundness there is also another, which, however, has so far not become popular or common, probably because there are so many ways of carrying it out, and no agreement as to a standard arrangement of it. This arrangement consists of gauging the cement and putting it into water for a certain time, the temperature of this water being increased to anything between 160° F. and boiling point. Another arrangement is to place the cement sample, after gauging, in water at 110° for 24 hours, when, if unsound, it will show signs of cracking; and still another is to put the pat or briquette in cold water, raise it gradually to boiling point, and keep it there for 2 or 3 hours.

The above deals fully with the checking of the mixing of the raw materials and thorough amalgamation of them, and also as to whether the proportions are correct; and, as mentioned earlier, as ordinary laborers have the control to a very large extent of this part, as well as the rest of the process, it is of no use whatever relying upon the name of any firm as a guarantee that the work has been thoroughly done; and the need is again emphasized of all cement being tested by the user before it is put into the work, instead of trusting blindly to the fact of its having been supplied by a good maker as a proof that it is a sound cement.

The second point on which the quality of the cement depends is as to whether it is properly burnt—or, in other words, whether all the carbonic acid gas has been driven off and the resulting mixture brought to the state of semi-vitrification necessary.

This is rather a difficult matter to prove.

Until the present fineness in grinding was arrived at, the weight per bushel of the cement, the measure being filled in a particular way, was the accepted test; but, seeing that this weight per bushel varies, even with the same cement, to an enormous extent, by difference in grinding, it is of little use. That this difference exists may be understood when it is noted that, taking the ordinary cement as 100, impalpable flour of the same cement would weigh only about 60, and residue about 130.

Provided the percentage of lime is not raised to a dangerous figure, the presence of a small amount of cement that is not thoroughly burnt does not do much harm; but if the percentage of lime is high, the cement will have a tendency to crack and swell through the presence of this under-burnt. The tests already given will, however, be to a certain extent a guide as to this burning being perfect enough.

The third and last condition as to the quality of the cement is that of the grinding, and this, although it does not affect the question of the soundness, has quite as great a bearing in the matter of the cement giving the strength and hardness for which it is calculated and placed in position.

There are a number of different grinding machines used by different cement makers, and each of these machines has its own effect in the reduction of the cement clinker to the marketable form. It is, however, generally admitted that practically the only part of the cement as bought that is of any value in the hardening and holding together in the work is that part that has been reduced to such a size and form—viz., that of impalpable powder, as to be soluble or capable of being acted upon by the water. The part that is not so capable of being acted upon, which in the trade is usually known as "residue," from the fact that it is what is left upon the fine sieves when cement is tested on them, consists of small pieces of clinker, and as a proof that the residue is valueless and is not affected by water when in the form of residue it has been stated that briquettes made with neat cement and tested and stored away for months, have on being reground (such regrinding probably reducing some of the residue contained in the original cement, which was evidently unaltered in the original gauging to its flour or cementitious form), and without reburning, have stood, when gauged a second time, a very considerable tensile strain, approaching very closely to what the briquette originally stood. This agrees perfectly with the results as shown by the new method of testing cement for fineness, which proves that cement as sold on the market varies in proportion of flour or cementitious matter from 50 per cent. down to as low as 20 per cent. The residue, although inert, as long as it remains in the form of residue, or small clinker, is of very little more value than sand, and is not influenced or altered in any way by being brought in contact with water, or even if soaked in it, as shown above. If, however, this residue is ground down to impalpable flour it probably constitutes the best of the cement.

The old test for fineness was to put a certain quantity of cement through a certain sieve of known mesh, usually one of 2,500 holes per square inch, or 5,800, and the usual percentage of residue left on these sieves was 2 or 3 and 5 to 8 per cent respectively.

It has been perfectly understood that this testing of the size of residue as a proof of perfection of grinding did not meet the case, as, even with the finest sieve procurable, a very large proportion of the matter that went through with the flour was only residue, and practically of no more value than the larger residue that would not pass through the sieve, and hence this proportion left on the sieve was not a guide as to the proportion of cementitious matter or impalpable flour that it contained, and its consequent value.

There is also no doubt that although the tensile strain and soundness tests are of the most important in testing cement, the test for proportion of flour is also a very important one, especially seeing that it governs to a very large extent the tensile strain, and a low tensile strain may often be explained by the fact proved by the Flourometer test that the cement is deficient in flour, viz., has not been ground sufficiently well to reduce the necessary proportion to an active state, and is therefore no better than a cement that has been very heavily adulterated, this disadvantage being emphasized by the fact that the adulterant has been paid for at the full cement price instead of the few shillings per ton ordinary sand (which would be quite as valuable) would cost.

In one of the new systems of burning, about which a great deal has been said and a great deal prophesied, it is rumored that the resulting clinker, which comes out in small nodules, and apparently in a very advantageous shape and size for grinding, is really so hard that it is almost impossible to get the proper proportion of flour, as the grinding efficiency of machines generally used for this is reduced by some 50 or 60 per cent., and even with that reduction in output of grinding plant the cement that is put into the warehouse from it is so deficient in flour that the tests are very much lower than they should be.

Without this fineness test it is, therefore, seen that the manufacturer may be blaming the proportion of lime contained in the cement as the reason for the low test, when it may be that this is perfectly correct, but that the fault is in imperfection of grinding. In the same way the user may put the cement down as being inherently weak cement when, after all, its failure is only due to the fact of the large proportion of residue contained in it, such residue being the same as a common adulterant. A cement that contains only 20 per cent. is naturally worth not nearly so much as a cement containing, as it should do, 40 per cent. or more, and it is suggested that all buyers should take particular care to see that this condition as to the proportion of flour should be taken into consideration with the price.

To sum up the whole of this article, what is intended to be advocated is that the old principle of trust got in a cement maker to send good cement is played out, and that although at times it may be necessary to send cement to some professional testers to confirm a test, as a rule it is absolutely necessary for any engineer who puts in work with cement, or any user who has to depend on the quality of the cement being right, to keep clear of damages and trouble, and, in fact, everyone who is interested in the using or buying of cement, to test it more or less systematically for themselves before they use it; and it is hardly necessary to point out that there are a number of engineers and contractors who have had trouble and cost through cement not being so tested, the loss of money on one such job often having been large enough to pay the entire cost of such testing for a lifetime, even leaving out the fact that the engineer's or contractor's name must necessarily be damaged to a certain extent by his being associated with work that has failed or given trouble through the material not having been of good quality.

Miscellaneous Notes of Interest to Electric Central Station Men.—No. II.[1]

By Mr. W. H. Wakeman.

Where an old lever safety valve on a boiler is to be replaced by a pop valve, it is not necessary to make the new one the same size as the old one, because the improved type is much more efficient than the old fashioned valve, therefore a smaller size will answer every purpose.

It is seldom that a lever valve is found on a boiler that will prevent the pressure from rising after it begins to open. A pop valve opens to its full capacity so quickly that there is little chance for an increase of

1. *Ante*, p. 122.

pressure, provided the valve had an area of 1 square inch for each 3 square feet of grate surface.

If a boiler compound is used to remove old scale from a boiler and it does its work well, there is great danger of the boiler being injured by it, therefore the engineer in charge should watch it with special care. It may have been the custom to clean boilers once each month, but when the compound begins to work it will loosen the scale, as well as dissolve it, and as the hard pieces cannot be blown out through the blow off pipe, they accumulate on the fire sheets, and may prevent water from reaching the metal, causing it to be burned. Under such conditions the manhole cover should be removed once each week, and all loose scale taken out. I have seen 34 quarts of loose scale in a medium sized boiler, that had been thrown down by the use of a compound, and thus became more dangerous than when it was clinging to the tubes. The next time that this boiler was opened it contained 30 quarts of loose scale. These two lots amounting to 2 bushels were thrown down within the time that it was customary to allow the boiler to go without cleaning, therefore if the same plan had been followed after the compound was used the fire sheet would have been bagged by the heat, and the damage would have been charged to the scale remover, or in other words it would have been condemned, because it did the work for which it was used.

When crude oil is used for this purpose it sometimes works into the joints, takes out the scale and dirt, making the boiler leak. It should be commended for this, but frequently it is discontinued, because it is claimed that the boiler is injured by it. As a rule this is a mistake, for a boiler should be tight when clean, and if the removal of scale and dirt exposes defects we should be glad to know the true condition of affairs, even if it does make repairs necessary.

It is sometimes quite difficult to get all of the old packing out of the stuffing box of a valve stem, or a piston rod, but when it has been in use long enough to get hard and allow steam to leak by it, every piece of it should be removed. Do not take out a part of it and then put in one or two rings of new packing on top of what is left, for while that may stop the steam from escaping, it makes it necessary to screw the gland down harder than it would if all of the packing was new, and this may cause the stem or rod to be scored.

Many of the large valves now furnished us have deep and narrow stuffing boxes, so that it is difficult to get the last ring of old packing out, but it is still advisable to remove it. On the last job of this kind that I had the bonnets of the valves were taken off, and the stems removed from them in order to make a clean job of it. This made some extra work, but it was a source of satisfaction when finished.

Some engineers keep their old oil cans of various kinds in plain sight in their engine rooms, but the object sought in so doing is not clear to us. Some of them are of no use, and none of them are ornamental, therefore it would look better if they were put in the cellar out of sight. A neat engine room is much more creditable than an untidy one, and people are much inclined to judge an engineer by the appearance of his engine room.

Plug cocks and gate valves usually answer a very good purpose on water pipes; but where it is desired to throttle the supply for any cause, they are not as convenient as a globe valve of improved design, and when they leak it is more difficult to repair them. A globe valve is not always desirable because the crooked passage through it causes a loss of pressure in the supply. There is usually an ell somewhere near the desired location of a valve, and if an angle valve is put on in place of this ell it will not create extra friction, and it possesses all the advantages of a globe valve.

It may not be necessary to keep the gauge cocks on a boiler in use every hour, as a well kept glass gauge is reliable, but they should be raised often enough to keep them in good order, for if a glass breaks they may be wanted at short notice.

On general principles it pays to put in an economizer and heat the feed water as hot as possible before it enters the boiler, but under some conditions it may not be a paying investment, and these should be investigated before one is installed in a plant. If the temperature of the products of combustion as they escape to the chimney is 700° or 800°, and the feed water is going into the boiler at 110° or 120°, there is a chance to save much heat.

On the other hand if the gasses are reduced to about 350° or 400°, and the feed water is raised to 212°, there is not so much chance for an economizer to pay for itself. This refers to a plant already in use, but when a new plant is to be erected it is well for the designing engineer to determine which will be the cheaper, to put in an economizer or add enough heating surface to the boiler to take up the surplus heat.

We are told that if the furnaces of our steam boilers were supplied with the proper quantity of air to produce complete combustion, and no more, we should secure much better results from the fuel used, and this is probably true, but when we study up the theory of the combustion of coal we find that there is a very extravagant claim made for the simple act of getting the right quantity of air, and if these results could be realized in practice it would revolutionize the business. A good fireman can save enough coal to pay his wages (where he fires several boilers of medium size) by attending to his duties in an intelligent manner, but if it was possible for a good one to evaporate as much water with 5 tons of coal, as a poor one can with 10 tons, steam users would soon find it out.

The Influence of the Load Factor on the Design and Operation of a Lighting and Power System.

[From a paper read by Mr. J. R. Robertson, at the Ottawa convention of the Canadian Electric Association.]

In selling power for working from 7 in the morning to 6 at night it soon became evident in northern latitudes that the hours of lighting overlapped very considerably the hours during which power was being sold. To meet this situation a proposition was made to manufacturers whereby the power load would cut off the lines before the heavy lighting load came on. The number of users of power under such limited service contracts is stated to be steadily increasing, and it is safe to predict that it will not be many years before the great majority of the large factories in Canada, especially in cities where current is supplied from water power plants, will shut the doors before dark. The stoppage of 2 hours out of 10 a day is stated, as a rule, not to lower the production, except on automatic machinery, more than 8 or 10 per cent., and by starting before 7 in the morning and reducing the noon hour slightly, the week's run may be made nevertheless to aggregate 60 hours.

Referring to the matter of rates, Mr. Robertson favored a system whereby no particular method of rate charging would be used, but each customer quoted a rate based upon the actual conditions of his business in such a way as to insure a proper return for the service supplied. Where during the day there is heavy machinery used for perhaps only a few hours, in order to supply the power transformers of large sizes must be installed, though the average power supplied for the day would not perhaps amount to one-half of the capacity installed. It is not advisable to charge such customers a straight meter rate unless this rate is very high, since the revenue derived would not be a fair average on the capacity demanded. In such cases it is better to charge a fixed rate per horse power on the maximum demand as ascertained by test, and to this add a meter rate per horse power or for the actual consumption.

Where the nature of the business carried on by the prospective customer is well known, the straight meter rate can be made satisfactory by inserting in the contract a stipulation that the revenue must not in any case be less than a fixed sum per month, thus protecting the supply company against loss of revenue. In some cases it may be advisable to quote two rates, one upon the fixed part of the load, motor and shafting, and another upon the variable part. In cases where the flat rate is required and the opinions of the central station manager and the customer differ radically as to the amount of power required, a compromise can usually be effected by quoting a rate based upon the amount estimated by the customer, with the stipulation that if the power required, as determined by test, is in excess of this amount. the additional amount will be paid for at the same rate.

In almost all cases it is recommended that the rate be based upon the maximum load demanded and not upon the average. In Montreal this policy has materially improved the conditions of the load of a great many customers, more especially those to whom power is supplied for elevator service. Passenger elevators that used to require 30-horse power to start now manage to start on 15 or 20, and there is no noticeable diminution in the speed of service; and factories that used to find it convenient to operate all their heavy machinery at once now find it economical to distribute the use of it throughout the day, thereby reducing the maximum demand and making their load much more regular.

Discussing rearranging and rebuilding a plant, with a view to operating a combined light and power service from the same generator and circuits, a frequency of about 60 is stated to be satisfactory. As to the question of 2-phase or 3-phase, it is stated that for such a system as that under consideration it is now pretty generally conceded that the generating plant should be 2-phase, as with this system the over-balancing effect of lighting on single phases has less effect on the regulation than it has on the 3-phase generator under the same conditions. In cases where power is to be transmitted over a considerable distance it may be transformed from 3-phase in stepping up and transformed back to 2-

phase at the receiving end. Four-wire 2-phase systems are pronounced more satisfactory than 3-wire 2-phase systems.

As to the type of motor, it is pretty generally conceded that for small motors the only type that can be considered is the induction motor. Such a thing as a burned out motor of this type is almost unknown. It is true that with motors of the wound type short circuits and ground sometimes occur, though rarely, and these can generally be traced to some defect in manufacture. With motors of the squirrel cage type the connection of the bars to the end rings sometimes gives trouble, but this is likewise generally due to some mechanical defect, and motors which have operated for some time without trouble can generally be depended upon to continue to do so indefinitely.

To offset the disadvantage of induction motors with respect to power factor, they should be operated at very high load as compared with other types of motors. The fact that these motors do not run synchronously with the generators is of great advantage to the station in times of trouble on the line. The only effect that heavy short circuits on the lines have on these motors is to cause them to slow down, and on sudden removal of the short circuit the extra power required to accelerate the speed and bring it back to normal, prevents the too rapid rise of voltage caused by the falling off in load with the valves or gates wide open, which rises are disastrous to incandescent lamps. An induction motor also acts as a sort of regulator on the lines, by absorbing more power from the phase with the higher voltage, thus tending to lower it to equality with the other. Changes of load on induction motors have also less effect on the regulation of the system than they would have with a synchronous motor, since the lowering of the load lowers the power factor, thus reacting on the generator field and preventing somewhat the rise of voltage which accompanies a reduction of load.

As to synchronous motors, while they possess a great many advantages, they have also some points to which objection can be taken. The attendant can, by varying the exciting current, lower the voltage of the lines to such an extent as to seriously interfere with the regulation, especially if the motor be of large capacity, as is often the case. Again, any violent disturbance on the line is likely to pull a heavily loaded synchronous motor out of step, and with motors of low self-induction, such as are necessary, this makes a particularly vicious short circuit. If there is any large amount of load driven by the motors of this type, the effect of a heavy short circuit would be to pull them all out of step, thus holding down the voltage. The removal of the short circuit with this large amount of load at the same time would permit the voltage of the generators to rise very considerably, and would usually be accompanied by disastrous effects on any lamps that might be burning on the circuits. In the case of large mills or other customers to whom continuity of service means much, the disadvantage should be carefully considered, as the starting of a large number of synchronous motors occupies considerable time, not to speak of the fact that goods in process of manufacture are sometimes spoiled by the deiay.

The principal advantage of the synchronous motor lies in the fact that its power factor is under the control of the operator, and the fact that by over exciting such motors lagging currents due to induction motors or arc lamps can be compensated for. If placed under the control of the station staff such motors become an invaluable means of increasing the output of the station. In plants where there are motor driven arc machines, or other machinery which under ordinary conditions is not in use during the day, it is advisable to have the motors of synchronous type, as in this case they can be operated all day as condensers supplying to the line the leading current necessary to balance the lagging component due to inductive load. In this way the machines do double duty, In placing synchronous motors on customers' premises beyond the control of the station it is advisable to install some sort of power factor indicator, as otherwise an inexperienced or careless operator will rarely have the exciting current at proper value. When it is considered that a reduction in the power factor from 100 to 99 per cent. involves an increase of wattless current to about 14 per cent. of the motor current, it can be understood how important it is that the power factor be kept up. As the exciting current varies for different loads and voltages, it is almost impossible in cases where the load is variable to keep the power factor at unity, unless the drop in the line exactly balances the regulation of the motor, in which case no adjustment of the field current is necessary for changes in load.

The simplest power factor indicator for 2-phase systems is an induction wattmeter with the series coil connected in one phase and the shunt coil across the other phase, or across a transformer if it is necessary to reduce the voltage. When connected in this way the meter will run in one direction if the current is lagging, and in another direction if the current is leading, remaining stationary if the power factor is unity.

In reply to a question by Mr. J. J. Wright as to whether the meter referred to in the paper would comply with the regulations of the Inland Revenue Department, Mr. Robertson remarked that he would have a meter that would read on two dials, and it would be simply a question of making a different rate for the indication of one dial to that of the other, and the entire registration of the day would be the sum of the two dials. He thought this would comply in every way with the Government regulations, as the meter itself could be entirely sealed the same as an ordinary meter and the governing medium would be outside of the meter.

Requirements of Electricity in Manufacturing Work.

[From a paper read by Mr. W. S. Aldrich, at the Milwaukee Meeting of the American Society of Mechanical Engineers.]

I.—General Considerations.

1. *Electric Transmission in Manufacturing Work is a Means to an End.*—Centralized power generation for light and manufacturing purposes; subdivision of the transmission system and the motive power equipment; execution of all classes of work; irrespective of its location; maximum efficiency of workmen, machines and labor involved; intensified production at best speeds and at the power limit of machines, with improved quality, maximum output and reduced cost.

2. *Sanitary Considerations.*—It is healthful, clean and free from dirt, dust and dripping oil; it affords accommodation and facilities for proper lighting and ventilation; it removes dangers from overhead machinery, shafting and belts; it reduces the sick list to a minimum; it insures quietness from absence of much unnecessary noise with older systems, and develops cheerfulness in workmen.

3. *Disciplinary Value.*—It improves the *morale* and the *personnel* of workmen; it conduces to shop order and discipline, with the most economic use of the workman's time, quick handling of material and maximum efficiency of labor.

4. *Flexibility of the System.*—Accessibility of all parts, adaptability to various uses and portability of tools, are inherent advantages.

5. *Reliability of Service.*—It is free from any general breakdown, localizing casualties and stopping least machinery for repairs; no accident can affect the whole plant in any case of a modern electrical installation properly designed, equipped and operated; it is more to be depended upon than any other system.

II.—Economics of Electricity in Manufacturing.

1. *Electric Power Generation.*—This system admits of centralized or concentrated power generation, which is required for maximum economy. Distributed power generation in small and scattered units is very wasteful. The electric power plant may be located to best advantage for fuel and water supplies, conveying and transportation facilities. It may be isolated from other structures, so reducing fire risks and insurance rates, especially where the boiler house is in a separate building. The electric generating sets may be subdivided into similar and independent units. These may be operated at all times under the most economic condition of normal loads. This permits manufacturing work in any branch or section of the establishment as economically under part load as under full load, on overtime and night shifts as during the day's work. Electric light may be supplied from the power mains or from separate generators, as conditions require. In not a few cases of the introduction of electric driving the additional saving has been more than enough to pay for all of the lighting service. The cost of generating electric power can only be a deciding factor when the total cost of power required is large compared to the running expense. The saving in fuel depends upon the cost of fuel, the average load, the amount of shafting and belting displaced.

2. *Electric Power Transmission.*—The distances are short in factory service, the electric distribution being within one building or a group of buildings. The so-called line losses are therefore usually negligible in well designed installations. Low voltages are employed in factory transmission. From 110 to 550 volts are the accepted limits at the present time in this country, either for direct or alternating current working at constant potential or pressure. The economics of the various systems can be only satisfactorily discussed with reference to any given project or installation.

The following are recognized methods of distribution, for electric light or power, or both, in manufacturing work:

Two-wire and 3-wire systems for direct or alternating currents.

Multi-circuit system for direct current multi-voltage service.

Single-phase, 2-wire alternating current.

Two-phase, 3 or 4-wire alternating current.

Three-phase, 3 or 4-wire alternating current.

Composite system direct current and single-phase or 2-phase alternating current on the same wires.

3. ***The First Cost of Electrical Installation.***—This will usually be higher for an electrical than for a mechanical transmission. The interest on first cost will rarely be a determining factor. It will be more than offset by the manufacturing economies elsewhere effected and by the reduced cost of shop buildings incident to the use of the electric drive.

4. ***Maintenance of Electric System.***—The cost of maintenance is a minimum. The depreciation is less than in any other system.

The saving effected is much more than sufficient to pay for all of the incidental repairs and renewals to the electrical machinery or the wiring system. Attendance and supervision are largely centralized and reduced to a minimum compatible with efficient service, owing to the reliability of the system. Electric generators and motors are the simplest types of motive power machinery that can be used in the development of power transmission for manufacturing work. They have the fewest parts requiring any renewals. They require practically no repairs. Electric machines will either work or not work. They soon make their wants known. They cannot be maintained in wasteful operation, as is the case with every other kind of motive power machinery. Standardization of this class of electrical machinery has facilitated repairs. They are quickly and easily made, at minimum cost and with least interference with the routine work of the establishment. Small electric motors in general require more frequent attention and renewals than larger machines. Belt tightening or lacing in the old system stops work on that section, and stops all work if it chances to be the main driving belt. Any similar casualty in the electric system is remedied at once by throwing into service another line, or a jumper, or a relay bus bar.

III.—Influence of Electric Transmission upon Factory Buildings.

The design, plan, and arrangement of manufacturing establishments are not now dictated or controlled by the new electric transmission, as always has been the case with the old mechanical system. Factory and mill construction is undergoing radical changes incident to the electric transmission of power. There is now a superior adaptation of the building to manufacturing work and sanitary requirements, with higher ceilings for light, ventilation, and overhead transportation. The cost of buildings is reduced to a minimum. The electric drive does not require the heavy construction of walls, overhead work, and roof trusses demanded by shafting transmission.

The site for buildings may be chosen independent of power considerations and located on most suitable ground. There is no necessity for buildings being placed around or adjacent to the power house, as required for mechanical connections to engines or turbines. Grouped shops may be arranged in best manner to facilitate economic production and the handling, conveying, and transportation of material and work. Detached buildings—a tendency of certain lines of modern manufacturing development—are feasible, and the work therein facilitated by electric transmission. The isolation of various shops, departments, and workrooms for manufacturing or insurance reasons may be carried to any extent with the electric system without impairing its efficiency or economy. The output per square foot of floor space is a maximum with electric transmission.

IV.—Influence of Electic Transmission upon Workshop Expansion.

Future areas of work may be planned and arranged for with the utmost freedom and entirely irrespective of power considerations. They can be located as desired, on separate floors, in various departments or in detached buildings. Original provision for prospective development is not necessary in the electric system, but is required by shafting transmission. There is no expense for contemplated additions till they are actually installed as required. Permanent additions to the electric generating plant and the distributing system are made with a gradual and ***pro rata*** outlay of capital, instead of in disproportionate blocks of new equipment, as required by mechanical transmission. Extensions of electric transmission and new centers of power distribution may be established at any time, and of reasonable capacity, anywhere and at any distance, at minimum cost for labor and material. There is no crowding, overloading, or interference with existing conditions, or with the daily progress of routine work. Temporary extensions, to meet sudden demands for power at any point, are quickly made by running to the desired location electric wires or cables. These are easily removed when no longer required, and as readily used elsewhere for similar purposes. The shifts are made with the least expense of time and labor in handling, and with no accompanying waste of material to suit different conditions. Auxiliary power is always at hand for emergencies, and to almost any reasonable extent, on account of the reserve nature of the electric supply.

V.—Influence of Electric Drive upon Arrangement of Machinery.

The floor space required per machine or tool is reduced to a minimum. The alignment of overhead shafting is no longer necessary. Clear overhead room is provided for handling all classes of heavy work. The crowding and complications arising from overhead shafts and belts are avoided. Location of machines and tools may be made to suit the requirements of the work and the available floor space. The product may then be finished with least time and labor, with least handling and transportation, and in the most efficient and economic manner. All the conditions of work and of labor may be arranged to handle tools and material to the best advantage, with freedom of workman's movements and facility in executing manufacturing operations.

VI.—Changing from the Old to the New System of Driving.

When alterations or additions in power transmission are required, it is the invariable practice in many modern shops to extend in the line of electric driving. This is notably the rule where electric supply is already at hand for either lighting or power service. In the rehabilitation of an old establishment some of the shafting transmission may usually be combined with the electric drive, as in the so-called group system. Much can be done to improve the power transmission if existing lines of shafting are divided into the most economic sectional lengths, determined by the speed, character of load, and kind of work. Electric motors will prove valuable adjuncts if installed to drive these sections independently. The electric drive is an economic and flexible auxiliary, supplementing the earlier and rigid mechanical power transmission. Such partial introduction of the new system, especially if an electric lighting plant is already in service, will early develop its advantages. It will defray the cost of installation and maintenance by greater economic production. Scrapping the old to make room for the new involves the same economic questions in the case of power transmission as in that of manufacturing machinery. Productive machinery should not in general be scrapped while there is retained the old system of belt driving, with its inherent power and speed limitations. The increased output of the old machine, electrically driven, will frequently equal that of a new machine, belt driven, and turning out the same kind of product.

VII.—Application of the Electric Drive.

1. ***Individual Driving Without Intermediate Gearing.***—The armature of the motor is mounted on the main spindle of the machine. The power is most directly applied, with ideal adaptation of tool to work.

It requires more or less special adaptation of motor to machine, with rarely any marked changes in the structural design of the latter.

2. ***Individual Driving With Intermediate Gearing.***—The motor is conveniently mounted on the frame of the machine, and drives it through the intervention of the ordinary gearing.

It requires no special adaptation of motor to machine. Any suitable motor may be used on any machine.

3. ***Advantages of the Individual Drive.***—The workman has the most perfect control of all factors entering into the economics of production. There is maximum economy in the application of power. The speed control and the output are independent of any other machine. They are no longer limited by the speed of the line shafting. Machines and tools may now be worked to the limits of their respective capacities. The productive efficiency of the machine is increased. It may be operated at all times up to the power limit, reducing time and cost of labor for any given product. The choice of the individual drive depends upon the power required, the size of the machine, the time it is in service, and the value of the product. The individual motor drive is usually adopted where the machine is in use only part of the time, and in sizes as small as 2 or 3-horse power, and requiring wide variations in speed and power for maximum output quite independent of the first cost. For large machines this method reduces the power losses to a minimum. It is particularly advantageous for shears, punches, and a class of repair shop tools requiring power only at intervals. The constructive details and design of direct driven machines are not usually altered to any extent: secondary speed changes are obtained by the usual change-gear and mechanism; in special cases of large tools, a range of speeds is sometimes best provided by a special variable speed motor.

4. *Group Driving.*—A few large electric motors are employed independently driving sections of shafting of most economical length. This method is thus adapted for driving a number of small machines, with no particular requirements in speed or in power; or for most economical manufacturing along special lines; or for driving any section on overtime or night shifts; or for independent driving of separate floors, departments or detached buildings.

The maximum economy with the group system can only be secured when all of the machines so driven are in constant use, at best speeds for maximum output. This dictates grouping machines as far as practicable of the same size, style, functions, speed and power requirements, having due regard to the work to be executed. Sectionalizing the power transmission by substituting electric motors for either the main or section belts secures partial advantages of the new system side by side with the old, and is frequently resorted to in old establishments adopting new methods.

5. *Individual and Group Driving.*—The most general requirements of factory transmission can all be met by an intelligent combination of these two methods of electric driving.

The first cost of installing the individual drive will generally be from 2 to 5 per cent. higher than for the best group system, when all other considerations are the same. The individual drive is more economical in the use of power than the group system, especially if in the latter only a limited number of grouped machines are in use at any one time, at average loads.

6. *Portable Tools and Appliances.*—The extreme flexibility of the electric system invites the widest use of portable tools and appliances. A flexible heavily armored cable gives any desirable radius of action, with no expense to maintain as a part of the transmission system, with no danger or difficulty in handling, and requiring least time and labor for any immediate shifting of tool or work. Least used tools need not occupy floor space when not in operation. Most favorable economic relations may, therefore, be secured in many lines of manufacturing work, especially of the heavier grades. Almost all required tools may be taken to and operated at the work in hand. Time is saved in not having to shift and adjust the work to the machine or tool. Several operations may be carried on at one time by bringing different tools to the work, each independently driven and operated.

7. *Electric Transportation and Conveying.*—Electric hauling by surface or overhead systems of distribution, electric conveying and telpher systems, electric cranes, hoists, lifts and elevators, are all well developed fields, and present no unusual nor insurmountable difficulties when installed as a part of the regular electric system of a manufacturing establishment. Tools are taken to the work, or machines and tools are quickly served with material and work, reducing the cost of all handling to the lowest terms in a field of non-productive labor that has formerly been very expensive.

8. *Electric Driven Auxiliaries.*—With an established electric suply service for all manufacturing work, it is an economic step to drive by electricity all auxiliaries, as pumps, fans, blowers, air compressors, etc.

SPECIAL ENGLISH CORRESPONDENCE.

COMMUNICATED BY NORTON H. HUMPHRYS.

SALISBURY, ENGLAND, July 10, 1901.

A Large Trade and No Profits.

The affairs of the Welsbach Incandescent Gas Light Company possess a special interest in gas circles for several reasons. In the first place it represents an attempt to secure the monopoly in regard to a particular appliance that is in general demand by all users of gas, and especially so by gas companies themselves, in connection with street lighting and other installations of a public character. Apart from this, as proprietors of regulated monopolies under Special Acts of Parliament, in which certain privileges are accompanied with obligations as to price, quality, limitation of profits and other matters, they are interested in watching an attempt to establish an unregulated monopoly under protection of the patent laws, that is, a privilege unaccompanied by any obligations of the nature just indicated. And a third reason for taking a special interest in the methods by which the Welsbach inventions have been exploited in this country, is the effect of such upon the prices at which the articles are obtainable, the prompt filling of orders, and the indirect effect upon the consumption of gas. No apology is necessary for devoting some considerable space to the affairs of this large undertaking. The usual annual meeting of shareholders was held on the 27th ult., and the reports of the proceedings, together with the comments on the same that have occupied prominent positions both in financial and technical periodicals, deserve attentive perusal. Differences of opinion as regards vital points in the management and conduct of affairs have prevailed for some time, and at the last meeting a managing director was appointed and also some additional directors. This year the managing director and his friends have resigned. So it will be readily understood that considerable personal feeling was evident throughout the proceedings. The original board remain in office, and have consented to the appointment of an influential advisory committee, who will examine the position and state of the business and report to the directors. If the directors see their way to accept this report they will do so, and if not, a special meeting of shareholders will be called. That there is plenty of material for the advisory committee to work on, was very evident from the report to the shareholders. As the *Financial News* remarks, in the course of a preface to a brief history of the undertaking, "The real inwardness of the present position is only apparent to those who have been able to devote a great deal of attention to the course of its affairs since it came before the investing public." And with a due respect for that opinion I propose in the following remarks to keep fairly close to the principal facts elicited in the report, speeches at the meeting, and discussions thereon.

The Company was founded about 3½ years ago, for the purpose of taking over 4 other concerns that had been established for the practical exploitation of the Welsbach patents, and a very large sum was disposed of in promotion expenses, purchase of patents, good will, commutation of services, and other intangible assets, and the capital raised was no less than £3,500,000 sterling. One would imagine that this sum would enable the directors to erect factories and plant sufficient to do a business of corresponding dimensions, that is to say a business of sufficient magnitude to earn a fair dividend on the capital. And therefore it is surprising that after nearly 4 years' operation, they are compelled to take the sum of £66,000, practically the whole balance available for distribution as dividends, to pay for the erection of new factories for the more economical conduct of the business. We cannot help wondering why these very necessary adjuncts to commercial success were not supplied at an earlier period, and the obvious conclusion is that the directors have been too much occupied with questions relating to their enormous capital, and to the costly and vexatious legal processes necessary in order to preserve public confidence in the stability of the same, to give proper attention to matters that are usually considered of the first importance in connection with the earning of a dividend, such as the exercise of every possible economy in the manufacture and sale of their special commodity. The usual questions before the board are those relating to the purchase of materials at the bottom price, and to the employment of a competent, though not excessive or overpaid staff. But with the Welsbach Company the first question has been to maintain the face value of the script. Whether this is possible is at best doubtful, as the quotations for the respective classes of share show a steady decline. The preferred and ordinary shares are obtainable to-day for less than a third of the rates quoted 2 years ago, and the deferred shares, which reached nearly 18s. each in 1899, can now be had for about 2s. And yet there has been a large increase in the actual business done. The sales for the year include about 8,000,000 mantles and 1,000,000 burners, being an increase of 46 and 75 per cent. respectively over the returns for the previous year. But the result of this large and growing trade is actually *nil*, so far as the shareholders are concerned. It seems that the £66,000 above noticed was earned in Austria, and that the British business has not paid a penny. The explanation put forward in respect to this extraordinary state of things is the reduction made in June last, a reduction which, like Pharaoh's lean kine, seems to have swallowed up all the profits earned during the preceding five months. Certainly a very considerable reduction was made at the date named, and the differences of opinion on the board appear to range round this point, some being in favor of keeping up the prices to a figure sufficient to pay a dividend, while others think that the wiser plan, even at a temporary loss, is to establish a large connection by means of liberal prices. It is a question of protection *vs.* free trade, of keeping up a high price under the shelter of the patent laws, or of selling at a figure that defies competition. A certain section of the board appear to have become alive to the fact that protection, if obtainable at all, can only be secured at an enormous expense. Those who countenance the protective policy cannot but be disheartened by the fall in the value of the property, notwithstanding the increasing business, and by the statement made on the authority of a former manager of one of the companies that there was a greater business done by outsiders than by the Company. The late managing director was largely responsible for the reduction in prices, and in the course of an able justification of his policy, dwelt strongly on the fact that apart from protection they were undersold in the market. Their prices were not the lowest, and unless they could rely on

monopoly patent protection there was no choice but to follow the lead which would take them to a position of commercial supremacy on the merits of their articles and the prices at which they were sold.

One of the advantages usually claimed on behalf of colossal undertakings is that they are able to undersell the small ones. The cottage artizan, working in his own home, complains that he cannot get a living at factory prices, and the small manufacturer finds himself unable to compete with the large firm, that has every advantage in the way of modern machinery and plant, having in fact, unlimited capital. But here the reverse is the case. The Welsbach Company have unlimited capital, and work on a scale of the first magnitude. The presumptive infringers, or many of them at any rate, are in a comparatively small way and do not enjoy these advantages. But yet the price which a section of the Welsbach management practically condemn as not being a living wage, is very much higher than that at which their rival finds it worth his while to risk the annoyance and loss consequent upon possible prosecution, a risk that he would not undertake in the absence of a substantial profit. The Welsbach Company, with an eye to the future, may sell mantles for less than cost, but no consideration of that sort applies to the outsider, who does not look beyond the present transaction. So apart from any question of patent rights or infringement we have the extraordinary spectacle of the small maker underselling the large, not by a mere shave, but by a matter of cent. per cent. The gentlemen who cannot see their way to a profit on mantles retailed at 7½d. or 9d., might find it expedient to compound a felony with the next infringer they catch, by letting him off scot free on condition that he instructs them in the art of selling a mantle for 4d. and yet getting a profit on it. The parties who have subscribed the enormous sum above mentioned naturally clamor for a dividend. However it may be when trade is bad, it is certainly hard lines to find "no dividend" in the face of a large and rapidly increasing trade. As the capital at present stands at about 10 times the annual turnover, it follows that an even cent. per cent. profit on the cost would not yield an enormous dividend, that the prices must be kept up to about double of what the outsider can afford to charge, or else there must be a very large increase in business, an increase sufficient to bring the annual turnover in line with the capital. It has also been suggested that the capital should be reduced, as a way of meeting the difficulty.

The most hopeful feature throughout the case, is the large increase of business that followed upon the reduction of price in June, 1900. This, coupled with the large trade done outside the Company, as a proof that a substantial business is waiting, and an earnest of a further development if only the price is right. We have the remarkable fact, which cannot but appear forcibly to all interested in the sale of gas, that in the year 1900, the consumption of mantles was in the neighborhood of 16 millions. The Welsbach Company will not lack public support so soon as they are sufficiently advanced to recognize the fact that the purchaser has his rights as well as the seller, and that standing out for a cent. per cent. profit is not the way to secure the good will of the public. The end of such a mistaken policy cannot be other than disastrous. The question of fair and reasonable dealing as between buyer and seller does not appear in the proceedings, and it would seem that, but for the "infringer" the price of mantles would to-day stand at about twice the present rate. So the other makers of mantles may claim to be public benefactors, and to have some reason for expecting considerate treatment and sympathy from purchasers.

Roughly there are about 3 millions of gas consumers in the British Isles, and the consumption of mantles ranged between 5 to 6 per consumer during 1900, which represents something like 2 burners in regular use. This fact, together with the rapid growth of the incandescent mantle business, at once disposes of the idea that the incandescent department, as compared with other lines of consumption of gas, is either a temporary or an insignificant matter, but a large and rapidly increasing trade, that should be attentively regarded and encouraged as such, by the suppliers of gas. This point is worth noticing in connection with the slot consumers, who represent the more respectable portion of our poorer classes, persons of good character occupying more or less responsible positions as employees. Their means are limited to their own personal earnings, and they naturally are keenly alive to every improvement that offers the advantage of economy. In this connection not only the efficiency but also the low consumption of gas peculiar to the incandescent system has not escaped their attention. So the statement made at the Welsbach meeting to the effect that probably only the outside fringe of the business has yet been touched is undoubtedly correct, and further, especially under the fostering care of the suppliers of gas, that a very large extension of the incandescent department may confidently be expected.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

We understand that Mr. William F. Thayer, for some time Superintendent of the Clinton (Mass.) Gas Light Company, has resigned that position, his retirement from its service to date from Thursday next.

During the trip abroad of Mr. C. H. Nettleton, President of the New Haven (Conn.) Gas Light Company, his duties in the latter instance are to be filled by his assistant in the office, Mr. Franklin M. Travis.

Messrs. M. P. Davis, W. J. Ponpore, J. C. Malone, D. Russell and J. H. Doody have purchased the franchises of the Gas Company at Three Rivers, Quebec. The franchise has 99 years of life, and the purchasers propose to rebuild the plant. Mr. George R. Ellis, for a long time connected with the St. John (N. B.) Gas Light Company, has been appointed Manager to the Three Rivers Company.

The Livermore (Cal.) Water and Power Company, in which Mr. W. J. Dingee is the controlling factor, has purchased the Livermore Gas Company. It is to be presumed that this trade means that the local squabbles in connection with the gas and electric lighting of Livermore are at an end, and that the gas supply thereof, which was shut off some months ago, will be restored.

Mrs. Helen Armstrong, of Chicago, in a recent letter to the Journal, says that she has just completed her 4th season with the gas companies as a demonstration lecturess in the matter of the use of gas in the kitchen. The first 2 months of her season were as usual passed in Southern cities, and the remaining 7 weeks were devoted to the interests of the Consolidated Gas Company, of New York city. She "lectured" in the handsome exhibit and lecture room of the Company on East 23d street, where appreciative audiences showed great interest in the intelligent efforts of Mrs. Armstrong to exemplify the advantages of gas as a household fuel.

At the annual election of the Plymouth (Mass.) Gas Light Company the only change in the Board of Directors was the naming of Mr. Charles S. Davis, to fill the vacancy occasioned by the death of Mr. William S. Danforth. Col. A. Parker Browne was, of course, re-elected Treasurer.

The Mohawk Gas Company, of Schenectady, N. Y., has increased its capital stock, to $290,000 from $154,000, the increase to have the form of preferred stock on the basis of a 6 per cent. per annum cumulative plan. The Company will also issue mortgage bonds in the sum of $250,000, the interest rate to be 4 per cent. per annum.

Mayor Dawson, of Morris, Ills., has vetoed the ordinance recently awarded the Morris Gas Company, under which the Company was authorized to increase its selling rate on lighting account to $1.75 per 1,000 cubic feet, from $1.50 per 1,000.

The City Council of Streator, Ills., has granted a 25-year extension of its franchise to the Streator Gas and Light Company.

The Poughkeepsie (N. Y.) ***Eagle*** says that the controlling interest in the Poughkeepsie Gas Light Company, owned for some years by Messrs. William H. Young and E. S. Atwater, has been acquired by the speculators who propose to amalgamate that property with those of the Poughkeepsie Electric Light and Power Company and the Poughkeepsie City and Wappingers Falls Electric Railway Company.

The scientific editor of the issue of the Akron (O.) ***Journal***, dated the 18th inst., said, referring to the difference of opinion that seems to exist between the city authorities and the Northern Ohio Traction Company, as to the illuminating value of the light that the latter is supplying on street account: "The purchase of a ***comptometer*** by the city, in order to see that the city lights are giving the requisite candle power, is not the only trouble which is in store for the Northern Ohio Traction Company in regard to street lighting." No matter what the "other trouble" is that may be in hiding for the Company, we have no doubt that it will triumphantly emerge from the test of the comptometer that is threatened.

General John P. Harbison informs us that Mr. A. E. Brown, formerly with Messrs. Weed & Kennedy, of this city, has accepted a responsible position in the clerical division of the Hartford City Gas

Light Company. Mr. Brown was with the Hartford Company some years ago.

MR. T. A. BATES, writing to the JOURNAL under date of the 18th inst., gives us the following particulars respecting the plant of the Manitowoc (Wis.) Gas Company, which plant was constructed under his immediate supervision:

"Having heretofore mentioned in the JOURNAL the formation of the Manitowoc Gas Company, I thought you might like to follow that with a description of the Company's works, now successfully completed according to the several contracts. Of course, it is a small plant, but those connected with it are satisfied that it will be quite equal to any demand that may be made upon it for some time. Further, the owners and constructors of the plant are agreed that it is of to-day, in respect of completeness and utility, a good model of a small coal gas works.

"The retort house is fitted with 2 arches for benches of 6's, on the Mitchell, full-depth, back-clinkering plan, 1 bench of which is filled. The hydraulic main, dip and stand pipes and mouthpieces are of the Western Gas Construction Company's pattern. Going on in detail, there is placed a No. 3 Roots' exhauster, with appropriate governor, bye-pass, etc.; a No. 2 Pelouze and Adouin tar extractor; a primary air condenser, 3 feet 6 inches diameter by 20 feet 6 inches high, provided with six 6-inch tubes by 20 feet, drain tank, etc.; one multitubular condenser 3 feet diameter by 20 feet in height, with forty-two 3-inch tubes, 16 feet in length. Bye-passes are provided wherever necessary, and the fittings are so placed that all can be duplicated to meet any increasing needs of the Company. A complete system of pressure gauges and the like is also provided. The purifiers, which are 8 feet by 10 feet by 5 feet, inside measurement, carry 2 tiers of trays, are fitted with overhead carriages for handling the covers, and have bottom outlets for the automatic discharge of spent material. The 5-foot station meter was furnished by Messrs. D. McDonald & Co., of Albany, N. Y., and it is an excellent example of modern station meter construction. The holder, which was constructed by the Stacey Manufacturing Company, is of the single-lift order, but so built that it may be telescoped at any time without putting the working section out of work. Its dimensions are: Diameter, 54 feet 6 inches; height, 22 feet. A complete Connelly automatic governor, with perfect system of bye-passes, is also installed. The boiler house and its distributing arrangements leave nothing to be desired. The bench work was designed and carried out by Mr. John Dell, of the Missouri Fire Brick Company. The present capacity of the plant is 125,000 cubic feet per day, which capacity can easily be doubled at a comparatively low cost. The Company at the time of writing has 200 meters set, and a like number of stoves are in service, and before September 1st, the proprietors are satisfied that the number of each will easily be 300. Its prospects in every direction are excellent."

THE Bay State Illuminating Company, of Augusta, Me., has been organized with a capital of $50,000, for the "purpose of operating and maintaining town and municipal lighting plants, either electric or gas, including acetylene gas." The concern proposes to make the business start of its existence by establishing an acetylene outfit in the town of Marion, Mass.

AT the annual meeting of the Bridgeton (N. J.) Gas Light Company no change was made in its executive management. Superintendent and Treasurer B. F. Harding came in for a heaping measure of praise in connection with the cleverness with which he planned and carried out last year the betterments on the Company's generating and distributing divisions.

ON January 1st, 1902, the net selling rates at Memphis, Tenn., are to be as follows: On an illuminating account, $1.42 per 1,000 cubic feet; for cooking, power and heating use, $1.19 per 1,000. The business of the Company prospers exceedingly.

AT the annual meeting of the Stratford (Ont.) Gas Company the officers chosen were: Directors, S. R. Hesson, John Corrie, A. J. Bailey, D. D. Burritt and T. Holiday, Sr. The improvements on the plant will be completed by September 25th.

THE Colonial Gas Construction Company has been incorporated at Trenton, N. J. It is capitalized in $100,000, and its incorporators are: Jacob Sandford, Mt. Vernon, N. Y.; P. H. Johnston, of Rutherford, N. J., and Otto J. Strasser, of East Rutherford, N. J. We have no further particulars concerning it.

A CORRESPONDENT in Savannah, Ga., writing under date of the 19th inst., says: "At a regular meeting of the Birmingham (Ala.) Board of Aldermen, held last Wednesday, an ordinance was passed granting to Caldwell Bradshaw, E. N. Cullom and C. R. Brodix a franchise to construct, own, equip, operate and maintain a gas plant for the purpose of manufacturing illuminating and fuel gas and to construct and maintain gas mains and other pipe lines for the purpose of distributing said gas from the place of its manufacture or from storage tanks to consumers. The rate for a fuel supply is put at 60 cents per 1,000, and the charge on illuminating account may not exceed 75 cents. It is stipulated that construction work is to be commenced not later than January 1, 1902, and mains are to be laid, for one mile in each direction from the Union Depot, by January 1, 1903. This is a most beautiful 'strike' piece of ordinance work, even for Alabama; but your correspondent feels quite safe in asserting that Bradshaw & Co. will never lay a mile of main in any direction; further, that they will never supply a 'cubic inch' of gas in Birmingham; and, further still, that they will never secure an 'angel' that will soar high enough from earth to buy their franchise."

A CORRESPONDENT incloses the following copy of an ordinance, recently adopted by the authorities of Hedrick, Ia., for the supply of gas to ordinary consumers in that town—the plant is to be operated on municipal account:

"Section 1.—That the price of gas furnished to private consumers by the town of Hedrick, Ia., shall be at the rate of $1.50 per 1,000 cubic feet of gas.

"Sec. 2.—That all bills for gas furnished such private consumers shall be due and payable on the first day of each month; and that a discount of 10 per cent. shall be rebated such consumers if bill is paid at any time within 10 days after the same is due.

"Sec. 3.—All accounts due the town of Hedrick, Ia., for gas, rates and rentals shall be payable at the office of the Town Clerk, and shall be paid without previous demand.

"Sec. 4.—Upon failure to pay for gas consumed, rates and rentals as provided in the two preceding sections of this ordinance, it shall be the duty of the Town Marshal to present the bill for such gas, rates and rentals to the delinquent consumer, and upon failure or refusal to pay the same the said Marshal shall at once proceed to disconnect such delinquent consumer from the mains.

"Sec. 5.—The town of Hedrick, Ia., shall furnish and pipe from the gas mains to the sidewalk line for all consumers of city gas, and the said town shall also furnish and install the cut-off required by the consumer.

"Sec. 6.—It shall be the duty of the Town Marshal to read the gas meters the first of each month and report the amount of gas consumed by each person to the Town Clerk.

"Sec. 7.—Gas meters shall be furnished to persons using said gas by the town of Hedrick, Iowa, at the following prices, to wit: Three-light meters at $3; $4 for 5-light meters, and $8 for 10-light meters, which shall be the total cost for meters so long as the consumer purchases gas from the town of Hedrick, Ia,, the meter remaining the property of the town.

"Sec. 8.—Nothing in this ordinance contained shall prevent consumers from purchasing and using any gas meter approved by the town council, said meters to be subject to inspection from time to time by the proper authorities, and the use of said meters shall be discontinued at any time upon the order of the town council.

"Sec. 9.—Persons using gas meters as provided in Sec. 7 of this ordinance may at any time purchase the same from the town, and the amount paid in the first instance as provided in said Sec. 7 shall be applied on the purchase price thereof.

"Sec. 10.—This ordinance shall be in force and effect upon its passage and publication as by law provided."

The Edison Storage Battery at Buffalo.

"O. E. D.," writing in *Iron Age*, says that the Edison storage battery reached the Pan-American Exposition on Saturday morning, July 20th, in ample time to be inspected and passed upon by the jury of awards, which begins its work this week. The claims made for the battery are that it is new and novel, thoroughly original and of light weight comparatively. A claim is also put in for the possibility of rapidly charging and discharging the battery without injury. Its efficiency in low temperature and its long life are other points in its favor. As has been stated, the battery is a combination of iron, nickel and potash. It can be overcharged and fully discharged or reversed and charged in the

(*Concluded on page* 175.)

THE AMERICAN GAS LIGHT JOURNAL

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(*Continued from page* 174)

opposite direction without injury. It can also be short circuited without injury, while to a lead battery this would mean ruination. Edison's battery weighs from 50 to 50 pounds to the horse power, while the average weight of present batteries is from 160 to 180 pounds per horse power. While it is not generally known, it is a fact that Edison has been using one of his new batteries for over a year in his laboratory, and as yet it shows not the least sign of deterioration, which is ample evidence that the battery has truly wonderful life. The battery is of superior workmanship, and its simplicity of construction is astonishing.

With the arrival of the Edison battery at the Pan-American the exposition has 4 types of battery on exhibition. In this connection it is interesting to note the progress made in this field since the World's Columbian Fair at Chicago in 1893. When the Chicago Fair was held little had been done in the storage battery industry, and little was shown. The years since then have been years of progress, and it is safe to say that to-day there are hundreds of thousands of horse power held in storage ready to be released for useful purposes. This latest invention of Edison's gives good promise of being an important factor in a still greater development within the next few years, and its influence on several fields of industry is without doubt destined to be very marked. This is especially true of the automobile field, where with a lighter battery, such as the Edison battery, available, there are good prospects for an important improvement. Still another thing that the Edison battery promises to bring to this field is an ability to fully discharge, while it has from 5 to 6 times the efficiency in output of current for the same weight.

The placing of this new battery on the market in the opening years of the 20th century gives intimation of a prospective development that will give greater courage to various industries. If in the commercial construction all the claims made for the battery are supported, and there is every reason to believe that they will be, it will be a most important addition to electrical appliances and apparatus.

The Market for Gas Securities.

The upward movement in Consolidated gas, reported a week ago, lost none of its force. The high point, reached this morning (Friday), was 221, and the closing was reported at 219 to 220. There is no particular reason for the advance, unless it be that investors and speculators are apparently becoming better alive to the knowledge that under the existing conditions, which latter are certain to improve rather than decrease, Consolidated is worth nearer to 250 than it is to 225. The deal that is to be made sooner or later with the Brooklyn Union Company cannot be much longer delayed. The physical condition of the latter Company's manufacturing and distributing plants is the moving matter. Other city gas shares are strong, notably Mutual, which is "bid" 315.

Brooklyn Union moved up 10 points, to 218, on Thursday last, on purchases of 800 shares. The stock is cheap at anything this side of 230, for the earning capacity of the concern, outside and apart from its physical disabilities, is simply tremendous. In fact, there is nothing the matter with the concern that money would not cure; and of money it has a plenty.

Baltimore gas remains steady. There is nothing of moment to report in connection with the probable ultimate ownership of the Gas and Electric Company of Bergen county, N. J.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.

16 WALL STREET, NEW YORK CITY.

JULY 29.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$73,177,000	100	219	220
Central Union, Bonds, 5's.	3,000,000	1,000	107	108
Equitable Bonds, 6's	1,000,000	1,000	105	
" 1st Con. 5's	2,300,000	1,000	115	118
Metropolitan Bonds	658,000	..	108	112
Mutual	3,500,000	100	315	320
" Bonds	1,500,000	1,000	100	102
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co. .. Bonds, 5's	11,000,000	1,000	108¾	109¼
Northern Union, Bonds, 5's.	1,250,000	1,000	106	108
New York and East River .. Bonds 1st 5's	3,500,000	1,000	111	115
" 1st Con. 5's	1,500,000	..	108	111
Richmond Co., S. I.	348,650	50	100	..
" Bonds	100,000	1,000	103	..
Standard	5,000,000	100	135	..
Preferred	5,000,000	100	153	..
Bonds, 1st Mortgage, 5's	1,500,000	1,000	115	117
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	214	219
" " Bonds (5's)	15 000,000	1,000	118	119
Bay State	50,000,000	50	⅝	¾
" Income Bonds	2,000,000	1,000	.	75
Binghamton Gas Works	450,000	100	29	35
" 1st Mtg. 5's	509,000	1,000	92½	95
Boston United Gas Co.— 1st Series S. F. Trust	7,000,000	1,000	82	85
2d " " "	3,000,000	1,000	47½	50
Buffalo City Gas Co.	5,500,000	100	6½	8
" " Bonds, 5's	5,250,000	1,000	73	76
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000		
Central San Francisco	2,000,000	..	106	108
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	104¼
Cincinnati Gas & Elec. Co.	29,500,000	100	103	103¼
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	106	107
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	60	65
Preferred	3,026,500	100	84	86
Consumers, Jersey City Bonds	600,000	1,000	102	103
Consumers, Toronto	1,700,000	50	215	216
Consolidated, Baltimore	11,000,000	100	65	.
Mortgage, 6's	3,600,000	..	..	118
Chesapeake, 1st 6's.	1,000,000	..	..	..
Equitable, 1st 6's.	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N.J.	1,000,000	100	13	15
" Con. Mtg. 5's	380,000	1,000	81½	85
Consolidated G. & E. Co.'s., Little Falls, N.Y.	90,000	100	..	100
Bonds	75,000	..	..	100
Detroit City Gas Co	4,825,500	50		89
" Prior Lien 5's	5,603,000	1,000	99½	100
Detroit Gas Co., 5's	381,000	1,000	89	89½
" Inc. 5's	16,000	100	94	94½
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	6,500,000	..	35	40
Fort Wayne	2,000,000	..	..	.
" Bonds	2,000,000	..	54	58
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	102	104
Hartford	750,000	25	240	250
Hudson County Gas Co., of New Jersey	10,500,000	..	25	..
" Bonds, 5's	10,500,000	..	101	103
Indianapolis	2,000,000	..	63	70
" Bonds, 6's	2 650,000	..	98	
Jackson Gas Co	250,000	50	70	75
" 1st Mtg. 5's	290,000	1,000	101	102½
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	36
Bonds, 1st 5's.	3,822,000	1,000	101½	103
Laclede, St. Louis	10,000,000	100	95	97
Preferred	2,500,000	100	99	101
Bonds	10,000,000	1,000	..	108½
Lafayette Gas Co., Ind.	1,000,000	100		60
Bonds	1,000,000	1,000	48	55
Louisville	2,570,000	50	110	120
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	102½	108
" 6 per cent. scrip, due 1910	100,000	25	87	89
Montreal, Canada	2,000,000	100	182	184¾
Newark, N. J., Con. Gas Co	6,000,000	..	..	55
Bonds, 6's	4,600,000	..	..	103
New Haven	1,000,000	25	280	300
Nashville Gas Lt. Co.	1,000,000	50	110	..
Oakland, Cal.	2,000,000	..	46	47
" Bonds	750,000	..	..	..
Peoples G. L. & Coke Co., of Chicago	25,000,000	100	114	114¼
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	
Rochester Gas & Elec. Co.	2,150,000	50	88	..
Preferred	2,150,000	50	118	..
Consolidated 5's	2,000,000	..	87½	90
San Francisco, Cal.	10,000,000	100	40	40½
St. Paul Gas Light Co.	1,500,000	100	53	60
1st Mortgage 6's.	650,000	1,000	82	85
Extension, 6's	600,000	1,000	..	..
General Mortgage, 5's	2,465,000	1,000	88	90⅛
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	85	87
Syracuse, N. Y.	1,750,000	100	16	19
Bonds	1,612 000	1,000	91	93
Washington, D. C	2,600,000	20	298	300
First mortgage 6's	600,000	..	..	..
Western, Milwaukee. Bonds, 5's	4,000,000	..	106	108
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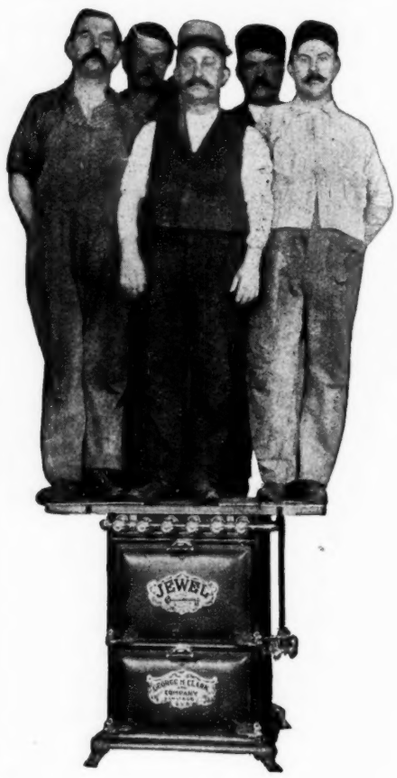

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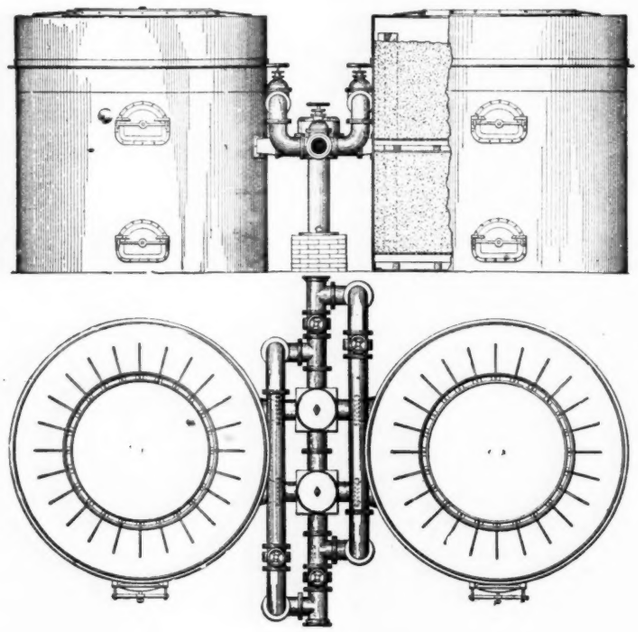

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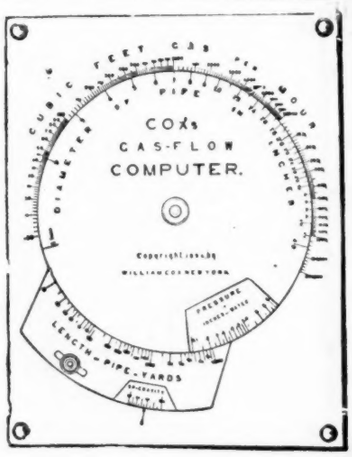

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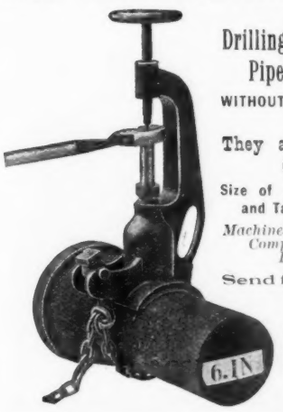

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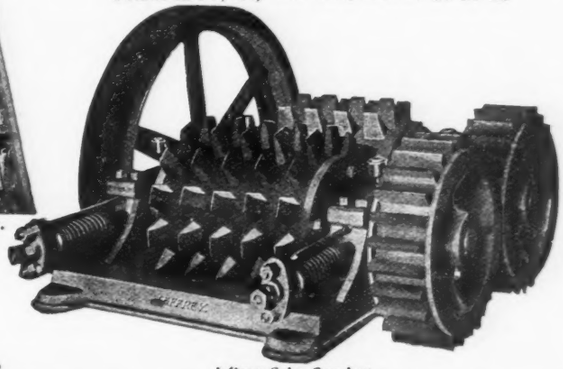

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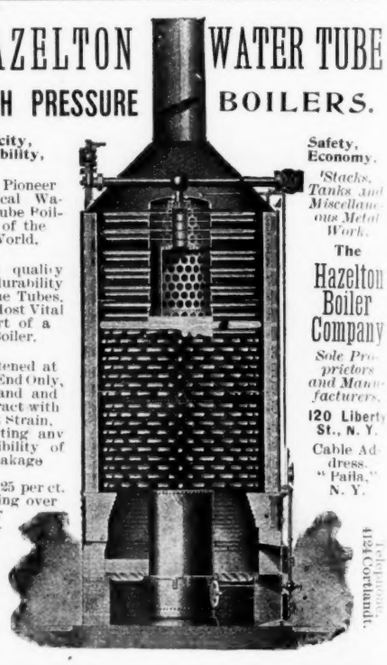

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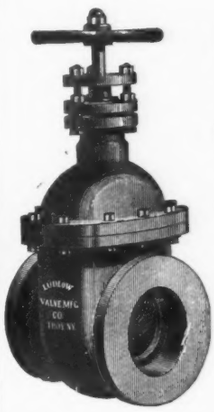

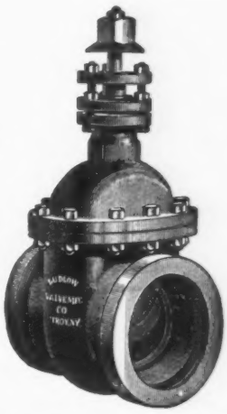

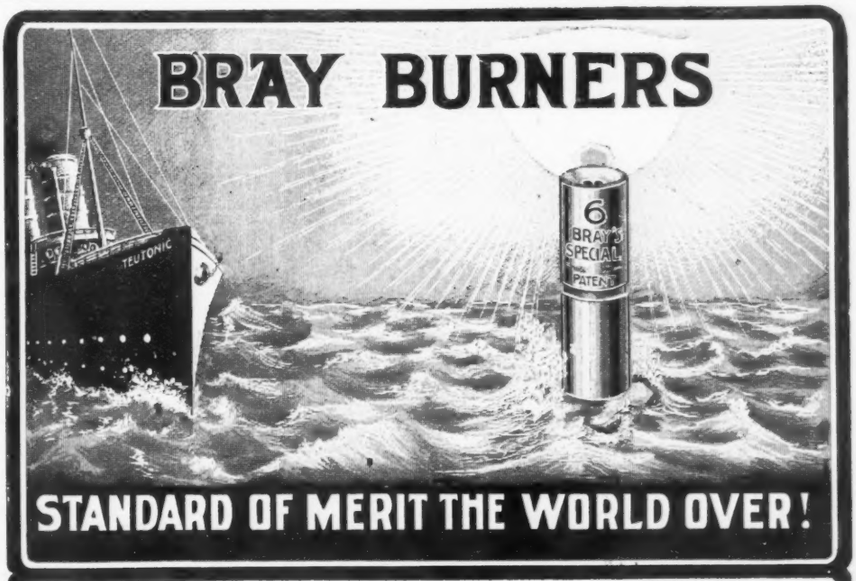

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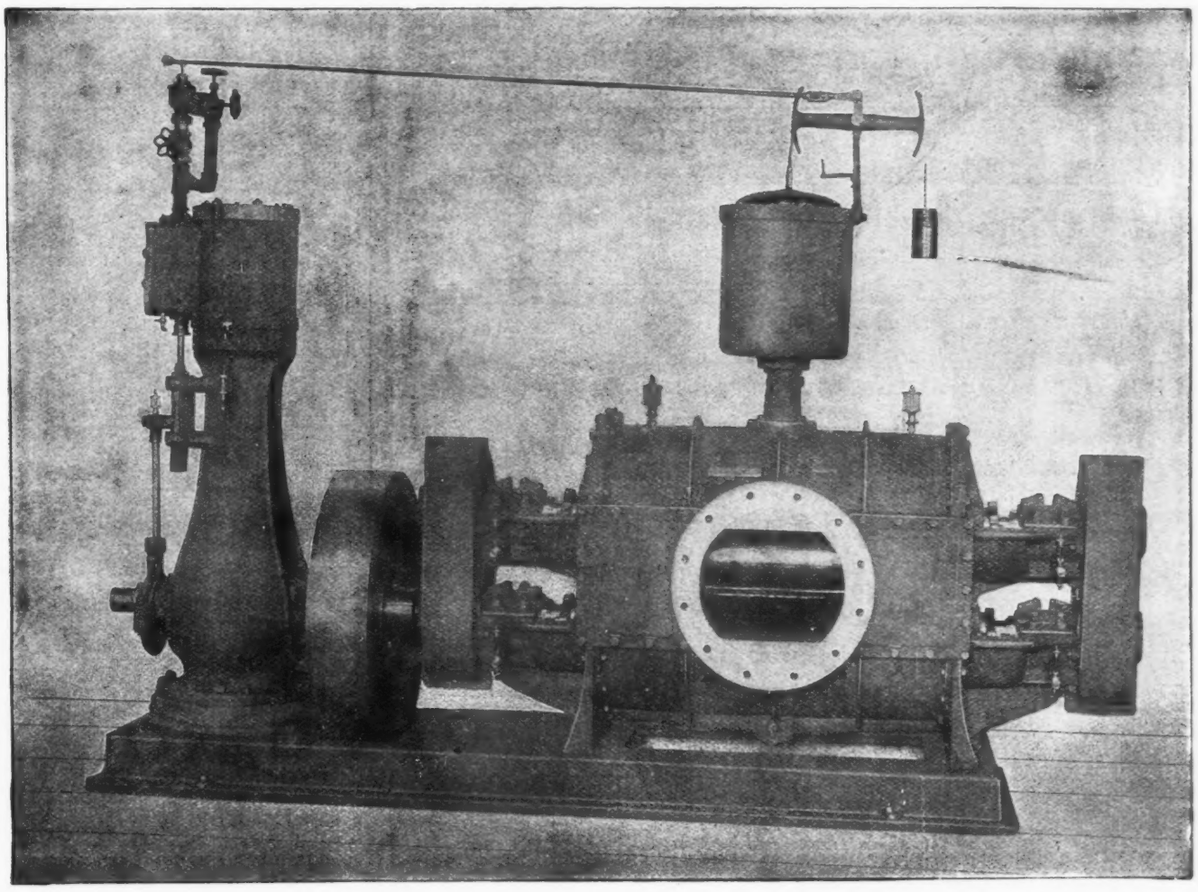

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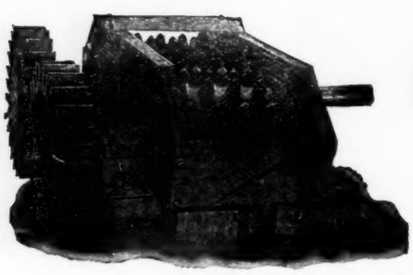

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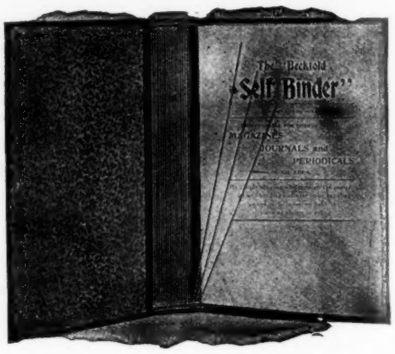

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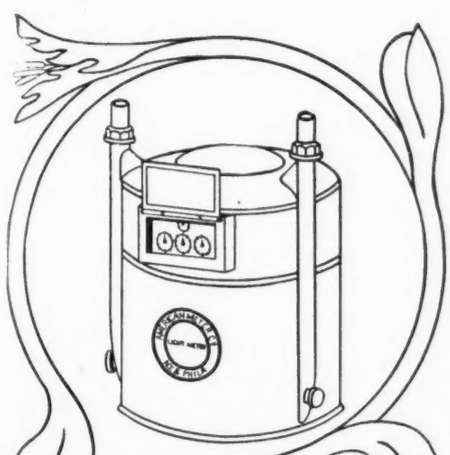

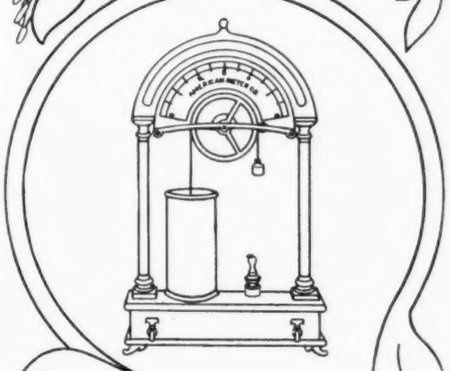

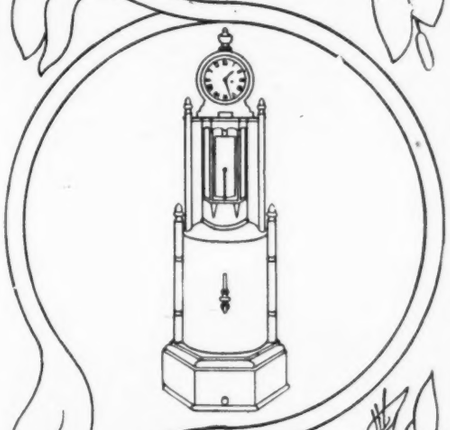

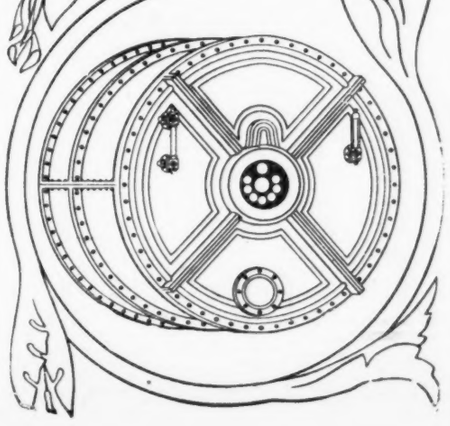

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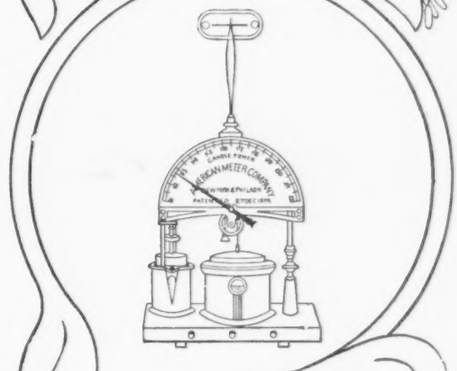
PUBLIC LIGHTING TABLE.

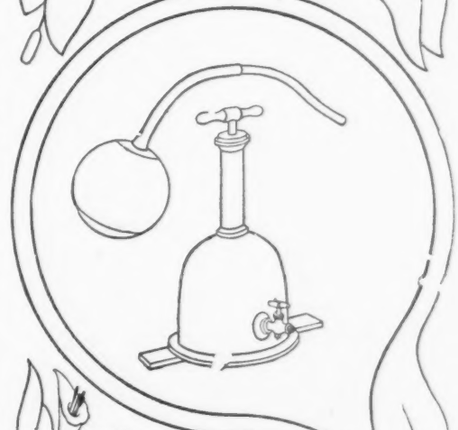
AUGUST, 1901.

Day of Week.	Date.	Table No. 1. Following the Moon. Light.	Table No. 1. Following the Moon. Extinguish.	Table No. 2. New York City. All Night Lighting. Light.	Table No. 2. New York City. All Night Lighting. Extinguish.
				P.M.	A.M.
Thu.	1	7.40 PM	8.40 PM	7.10	3.30
Fri.	2	7.40	9.20	7.10	3.30
Sat.	3	7.40	9.50	7.10	3.30
Sun.	4	7.40	10.20	7.10	3.30
Mon.	5	7.40	11.00	7.10	3.30
Tue.	6	7.40 LQ	11.40	7.10	3.45
Wed.	7	7.40	12.30 AM	7.10	3.45
Thu.	8	7.40	1.20	7.10	3.45
Fri.	9	7.40	2.10	7.10	3.45
Sat.	10	7.40	4.10	7.10	3.45
Sun.	11	7.30	4.10	7.10	3.45
Mon.	12	7.30	4.10	7.10	3.45
Tue.	13	7.30 NM	4.10	6.55	4.00
Wed.	14	7.30	4.10	6.55	4.00
Thu.	15	7.30	4.10	6.55	4.00
Fri.	16	7.30	4.10	6.55	4.00
Sat.	17	7.30	4.10	6.55	4.00
Sun.	18	7.50	4.20	6.55	4.00
Mon.	19	8.20	4.20	6.55	4.00
Tue.	20	8.50	4.20	6.45	4.10
Wed.	21	9.30 FQ	4.20	6.45	4.10
Thu.	22	10.10	4.20	6.45	4.10
Fri.	23	11.00	4.20	6.45	4.10
Sat.	24	11.50	4.20	6.45	4.10
Sun.	25	12.50 AM	4.20	6.45	4.10
Mon.	26	2.00	4.20	6.45	4.10
Tue.	27	3.00	4.20	6.30	4.20
Wed.	28	No L.	No L.	6.30	4.20
Thu.	29	No L. FM	No L.	6.30	4.20
Fri.	30	No L.	No L.	6.30	4.20
Sat.	31	7.00 PM	8.20 PM	6.30	4.20

TOTAL HOURS LIGHTING DURING 1901.

By Table No. 1.	Hrs.Min.	By Table No. 2.	Hrs.Min.
January	220.10	January	423.20
February	192.30	February	355.25
March	180.00	March	355.35
April	158.30	April	298.50
May	140.40	May	264.50
June	135.40	June	234.25
July	138.00	July	243.45
August	156.20	August	280.25
September	174.40	September	321.15
October	202.30	October	374.30
November	220.40	November	401.40
December	241.30	December	433.45
Total, yr.	2161.10	Total, yr.	3987.45





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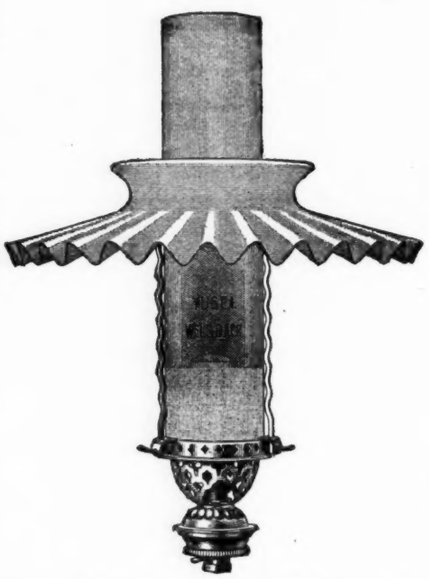

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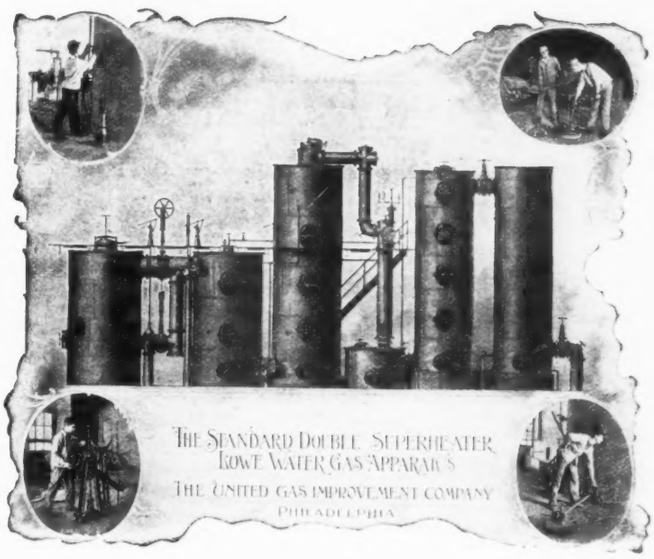
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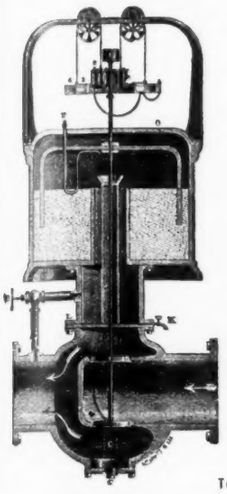

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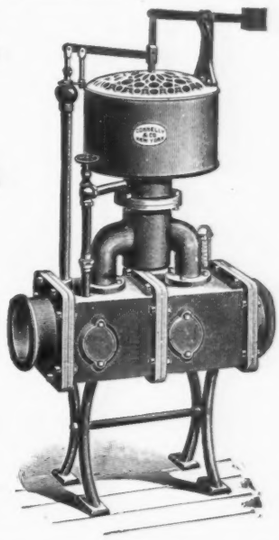

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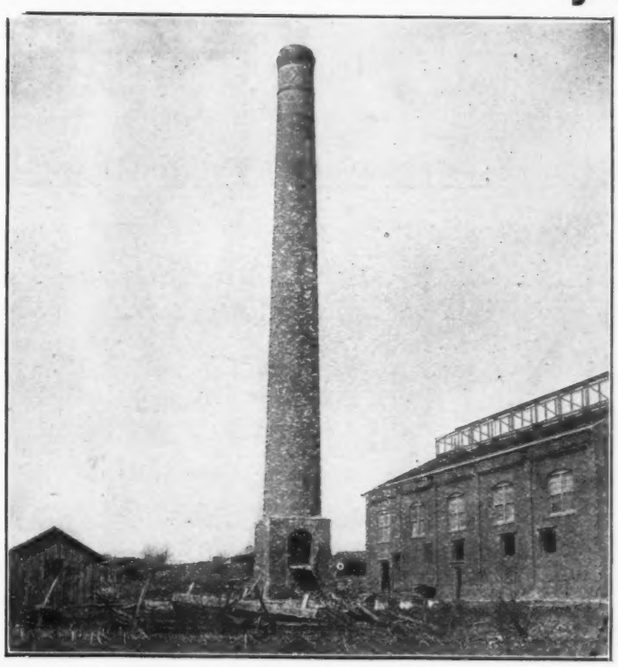

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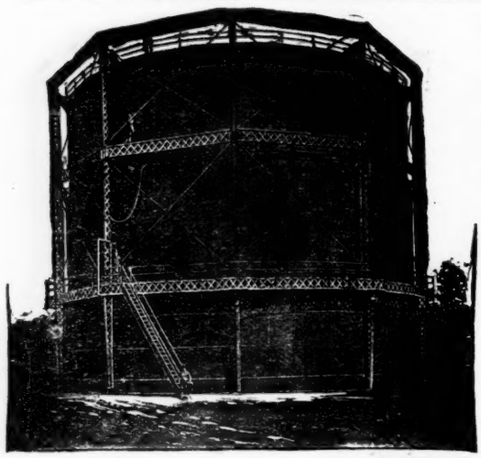

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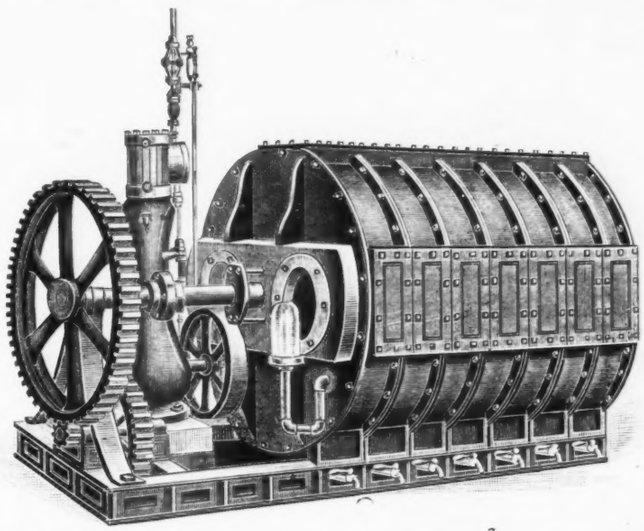

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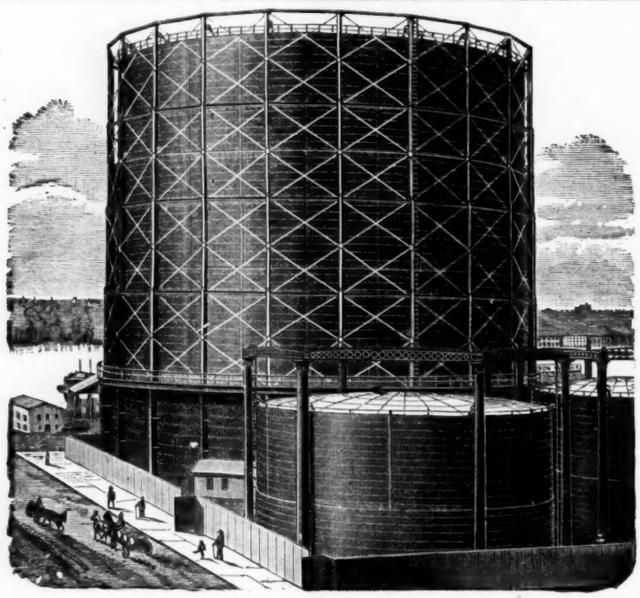

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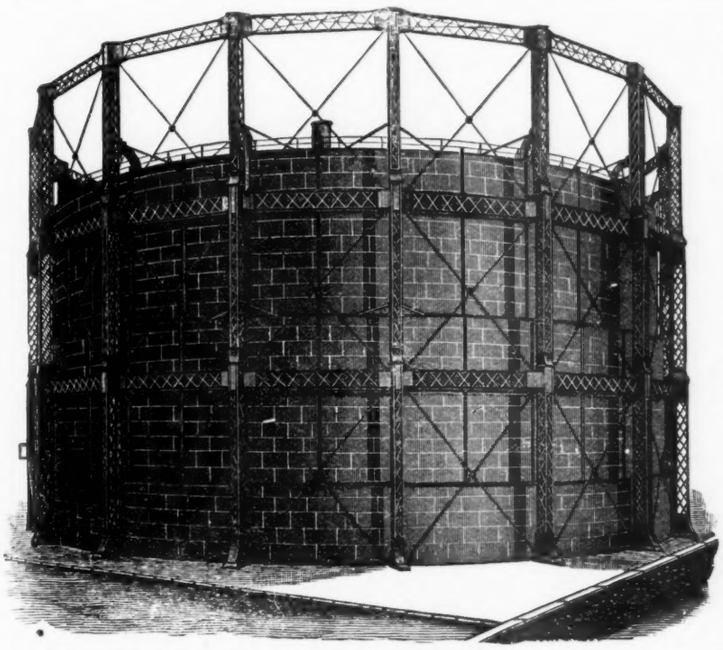

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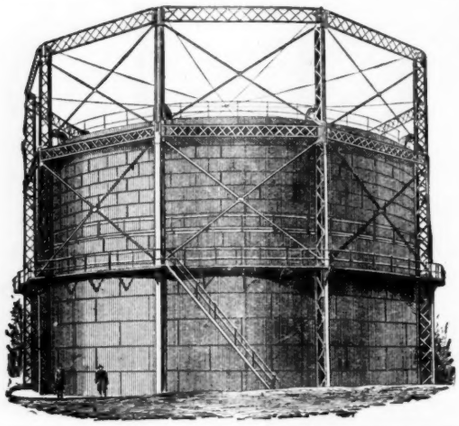

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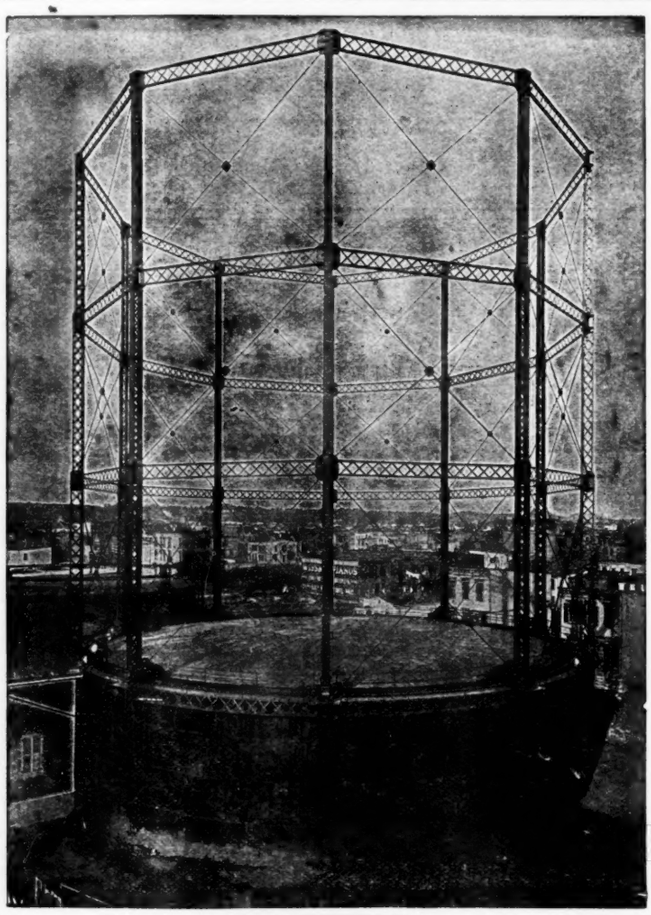

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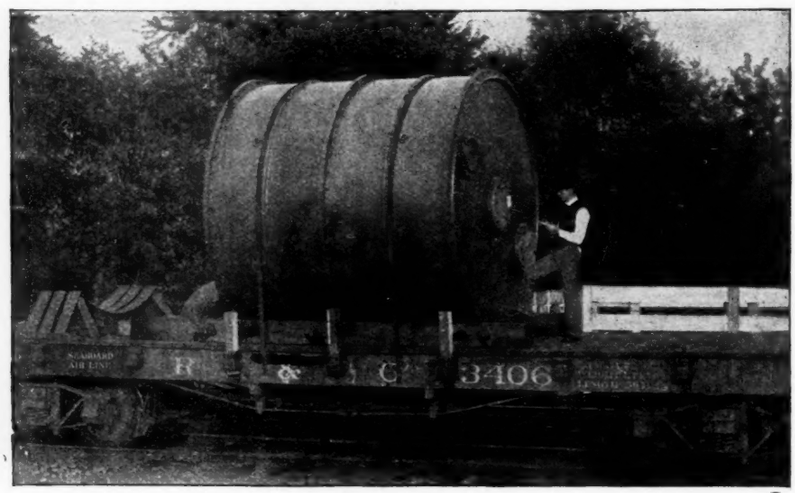

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